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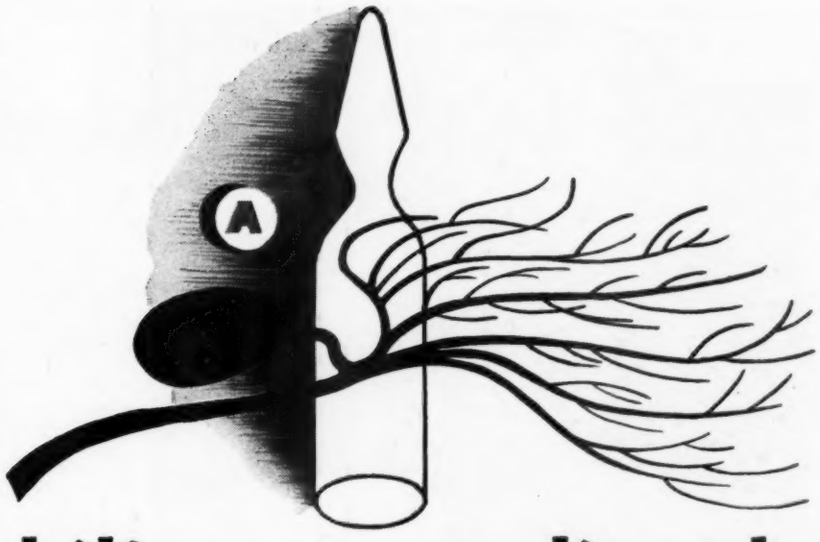

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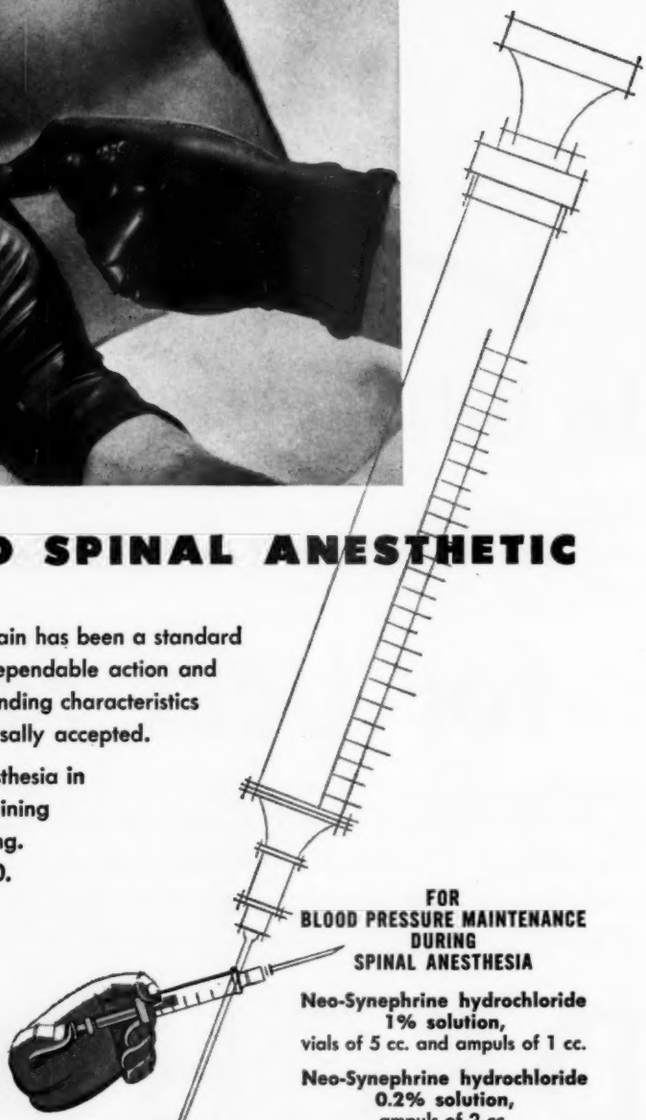

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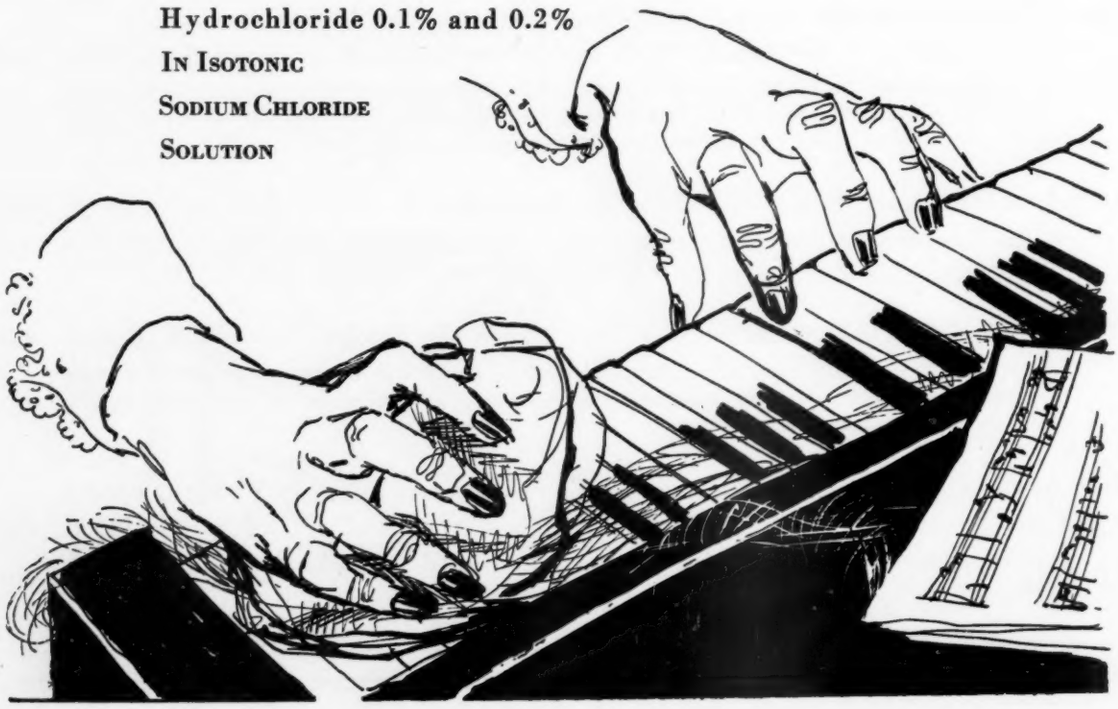
1. Graubard, D. J., and Peterson, M. C. (1949), Intravenous Use of Procaine in the Management of Arthritis, J. Amer. Med. Assn., 141:756, Nov. 12.



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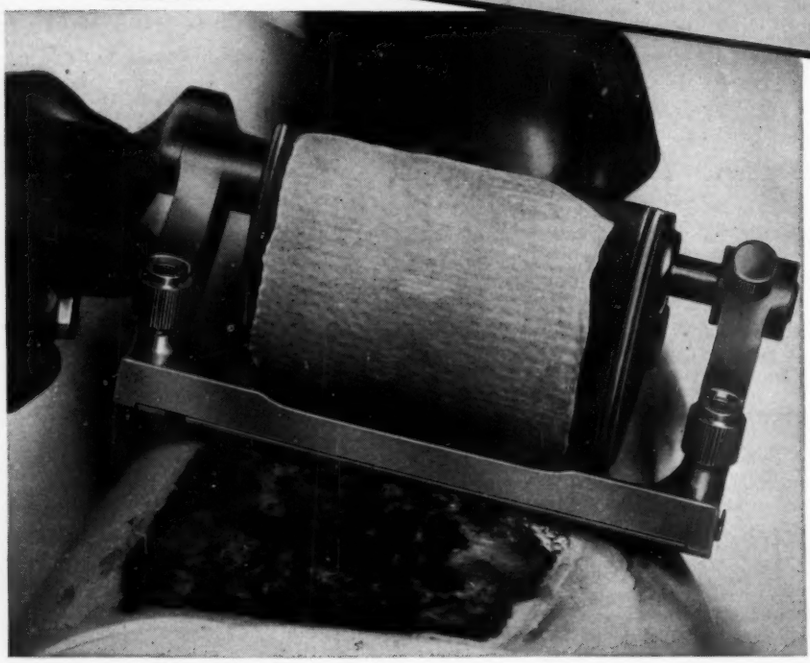

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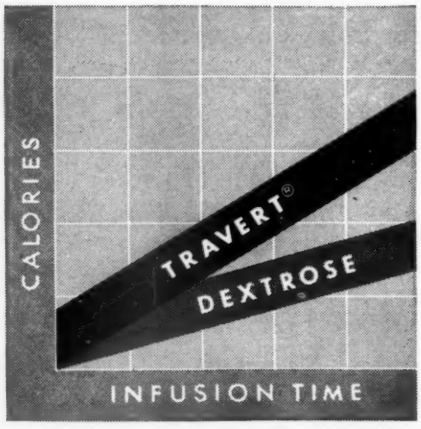

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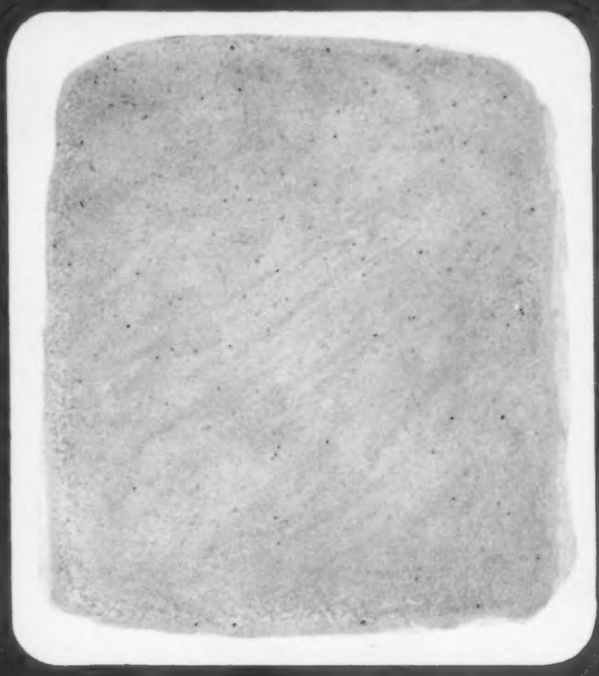

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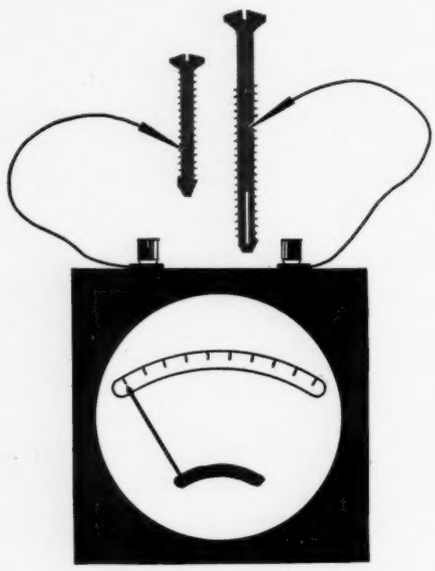

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**Three Years Experience with Vitallium—Venable, C. S. & Stuck, W. G. Ann. Surg.—114-2—Aug. 1941*

**A General Consideration of Metals for Buried Appliances in Surgery—Venable, C. S. & Stuck, W. G.—Surg. Gynec. & Obst. 76-4 Apr. 1943*

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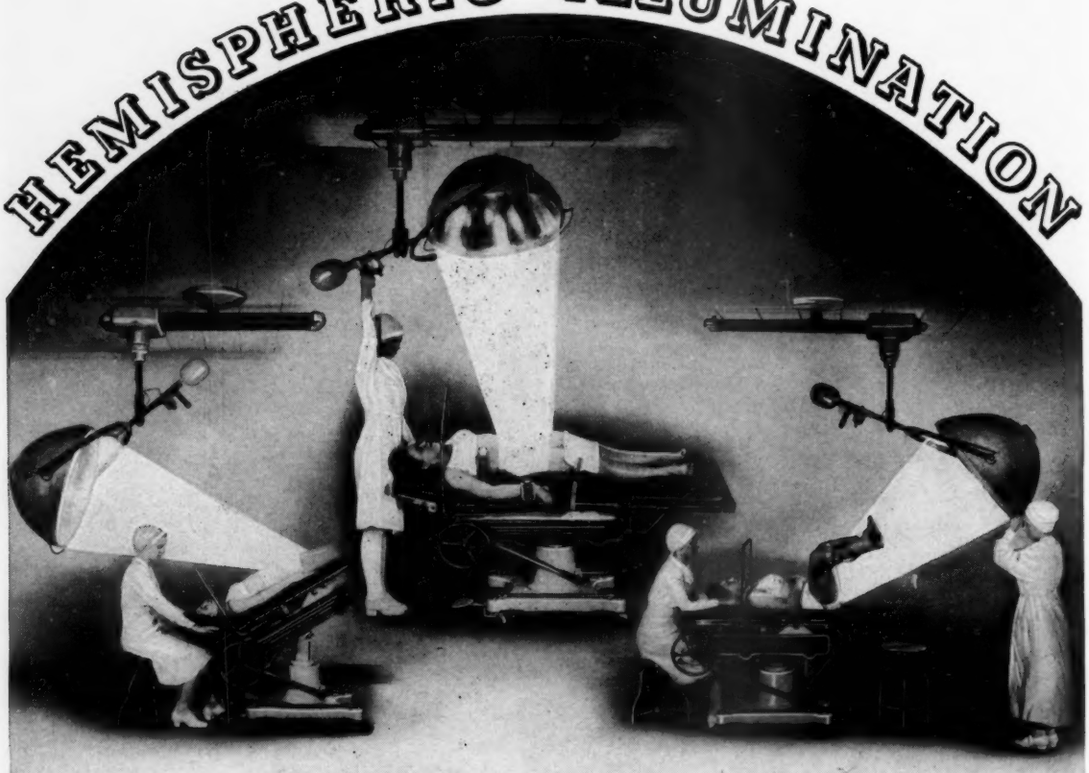

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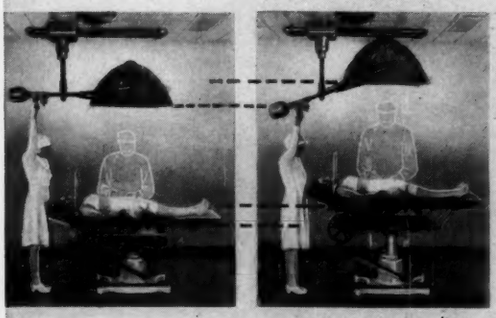

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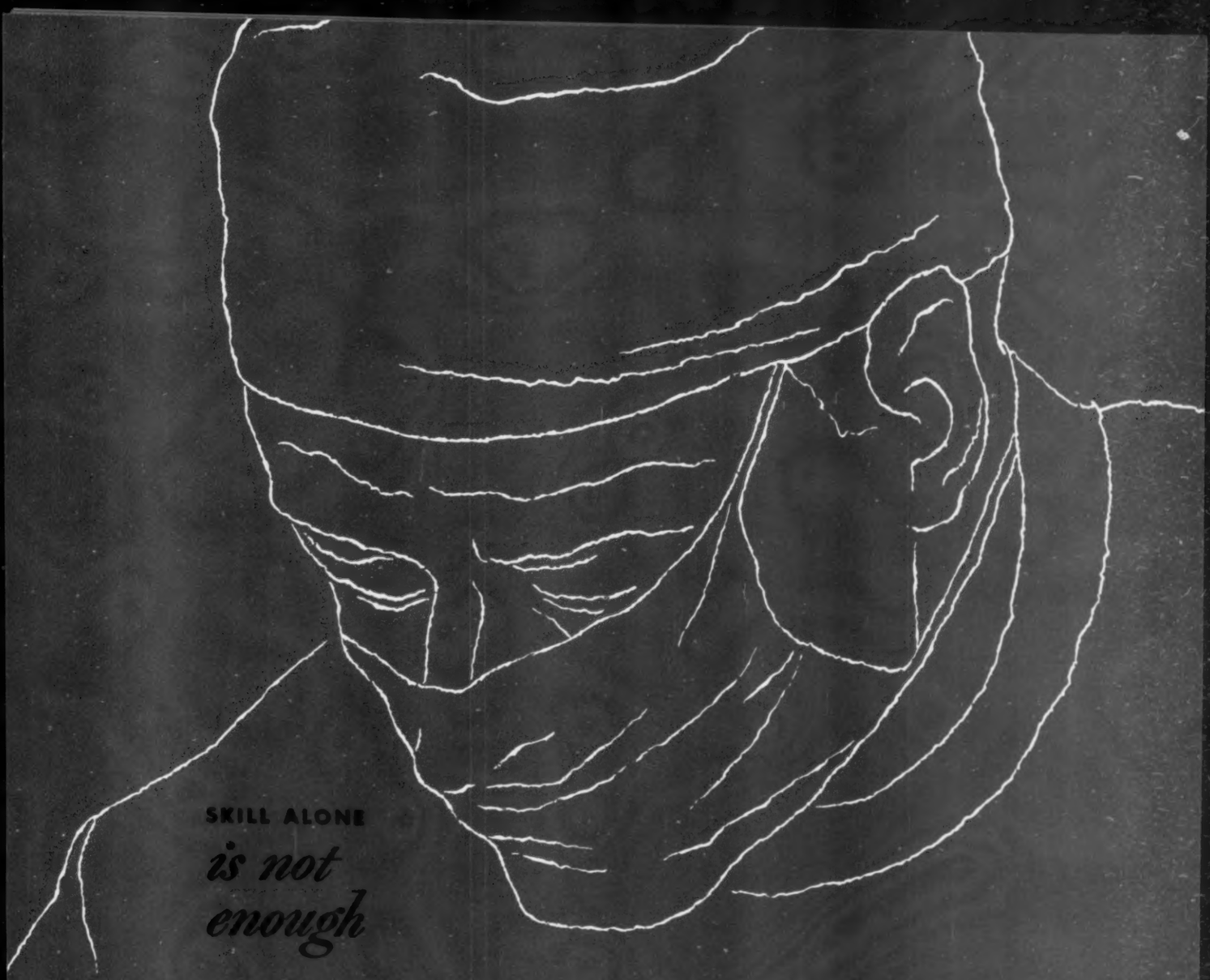

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Designed primarily to meet the exacting requirements of urologic electro-surgery, this WAPPLER SURGICAL UNIT combines great power with precise and **blended** control (when required) of cutting and coagulating currents in any proportion desired. For transurethral resections, and other urologic procedures, this high frequency unit cuts and coagulates with such ease and speed as to expedite materially the most difficult techniques. When the employment of tissue cutting and haemostatic currents is indicated in other fields, such as General, Thoracic, Proctologic, Ophthalmologic Surgery, etc., the remarkable simplicity of control, complete dependability and uniformly excellent results achieved with the WAPPLER C-263 recommend it as the instrument of choice.

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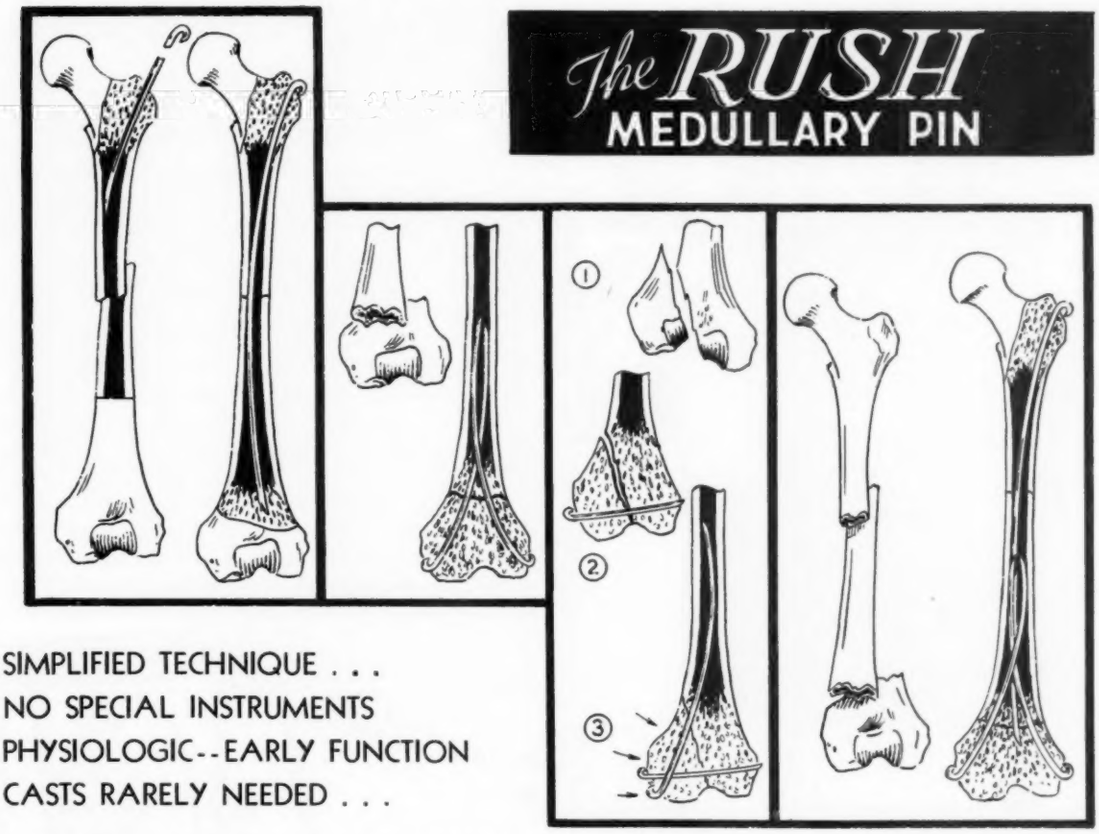

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- ✓ SIMPLIFIED TECHNIQUE . . .
- ✓ NO SPECIAL INSTRUMENTS
- ✓ PHYSIOLOGIC--EARLY FUNCTION
- ✓ CASTS RARELY NEEDED . . .

The Rush Intramedullary Pin is fashioned from Type 316 stainless steel which has been specially hardened to the temper which clinical research has shown to be optimum for this purpose.

The Pin is designed to not completely fill the medullary canal of the bone, and is constructed so that it can be introduced axially into the bone through either the end or side.

No special instruments are required. The Pin is introduced into the bone through a suitable drill hole and is driven in with the mallet. A sled-runner point simplifies the introduction of the Pin into the medullary canal. The smallness of the diameter of the Pin and its temper permits it to take a curve to facilitate its introduction while having sufficient elasticity to realign itself within the bone. The security of the fixation utilizes the normal muscle pull of an extremity to secure three-point pressure within the medullary canal.

Techniques have been worked out making it possible to fix many fractures near joints which heretofore have not been accomplished by other forms of medullary fixation.

A special hooked head prevents the Pin from migrating into the bone. This head makes it possible to remove the Pin by the use of the screw driver and mallet. A pair of pliers is an excellent adjunct in both insertion and removal of the Pin as it can be guided by rotation.

NOTE: All authentic Rush Pins bear the trademark BERIVON.

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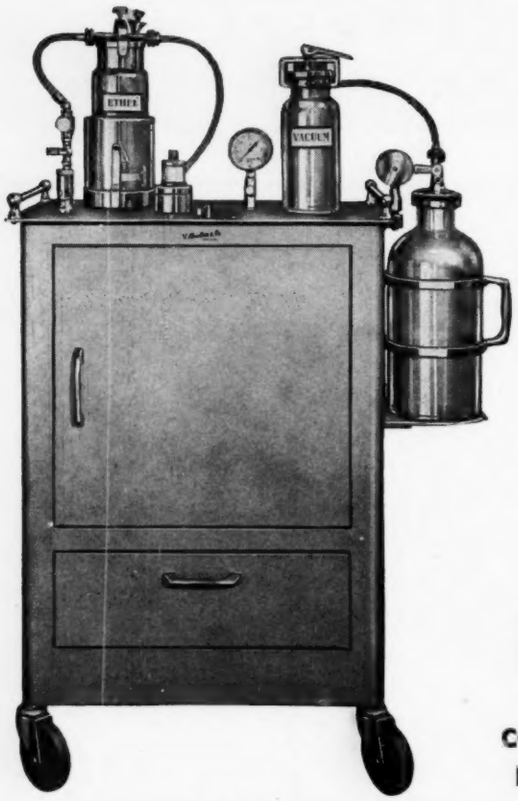

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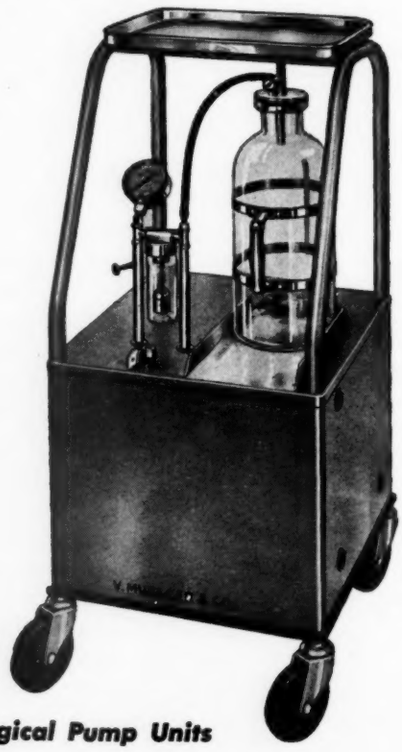

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This new heavy duty surgical suction unit creates a controlled vacuum of from 0 to 25 inches of mercury . . . Its quiet, dependable power and ample capacity make it the ideal unit for any case requiring suction . . . It is simple, wholly functional, and requires only 16″ x 16″ of floor space . . . Carefully designed with a minimum of moving parts, this new explosion-proof unit is built to give you safe, dependable service under all operative conditions. Operates on 110 volts, AC only. Prompt delivery now! Write for complete details.

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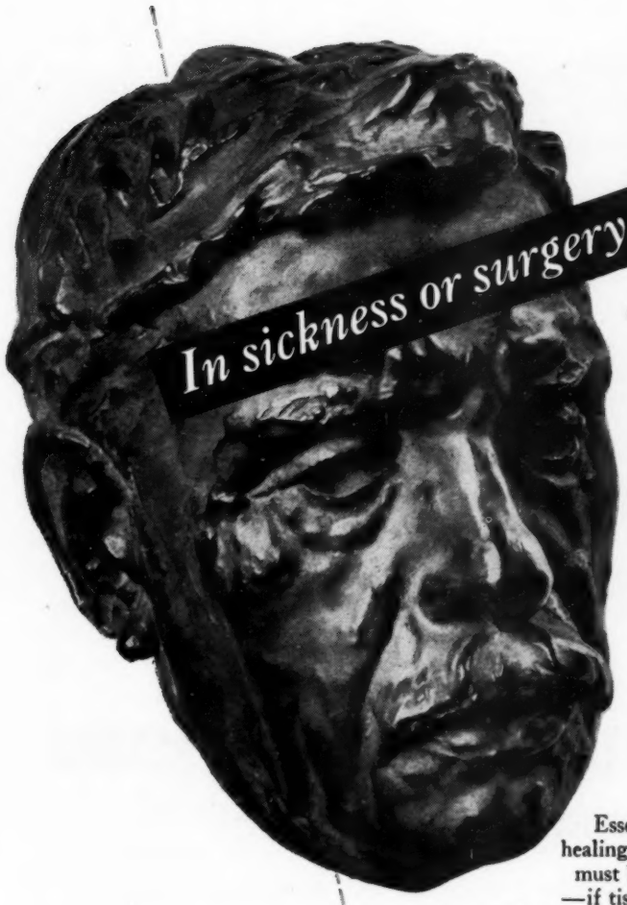

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Depletion of the critical water-soluble B complex and C vitamins occurs so commonly in the presence of physical pathology, as to make a presumption of nutritive impairment[2] almost axiomatic. Essential to normal cell metabolism and wound healing, these poorly-stored, readily-diffusible factors must be replenished — usually by *massive dosage* — if tissue rehabilitation[3] and return to health[4] are to be expedited. • Allbee with C 'Robins' provides this all-important "saturation dosage" in convenient capsule form. It incorporates the important B factors in 2 to 15 times daily requirements, plus 250 mg. of vitamin C — *the highest strength of ascorbic acid available today in a multi-vitamin capsule.* • Its prescription represents a sound contribution toward decisive recovery from disease, or toward pre- and post-operative nutritional support.[1]

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FORMULA: ***Each Allbee with C capsule contains:***

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Riboflavin (B_2)	10 mg.
Nicotinamide	50 mg.
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Ascorbic acid (C)	250 mg.

REFERENCES: 1. Coller, F. A. and DeWeese, M. S.: Preoperative and Postoperative Care, J.A.M.A., 141:641, 1949. 2. Jolliffe, N. and Smith, J. J.: Med. Clin. North America, 27:567, 1943. 3. Kruse, H. D.: Proc. Conf. Convalescent Care, New York Acad. Med., 1940.
4. Spies, T. D.: Med. Clin. North America, 27:273, 1943.

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TOMPKINS PORTABLE ROTARY COMPRESSOR

fireproof and explosionproof

After years of research, Sklar engineers have developed the first suction, pressure and anesthesia apparatus which can be operated with safety in atmospheres containing ethyl-ether, cyclopropane and ethylene *(Class I, Group C Locations)*. The new Tompkins Portable Rotary Compressor has been approved—not merely for some of its individual components—but *as a complete unit* by Underwriters' Laboratories. *It is designed specifically for use where highly volatile anesthetic agents are used because of its provision for the dissipation of static electricity.* Another remarkable feature: *There's nothing to get out of order*—the only care required is lubrication! Complete details on request.

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- *Heavy-duty, spring-suspended motor*
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- *2-way pressure by-pass valve*
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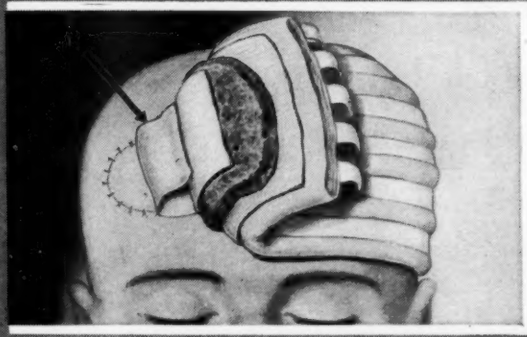

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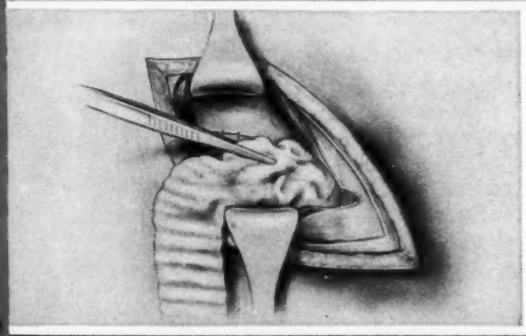

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Clay-Adams

Caudal and Spinal Analgesia Technics Improved by Animal-Tested Polyethylene Tubing

By J. HALPERIN, M.D., Brooklyn, New York

We have been using conduction analgesia in obstetrics since 1943, and our experience in more than 18,000 cases has been very satisfactory. The percentage of partial or total failures has been insignificant. The anaesthetic agent used is Metycaine 1½%. Up to 1950, we employed the needle technic, leaving the needle *in situ* during labor, until the patient was ready for delivery. In Cesarean Sections, the needle was left in the subarachnoid space throughout the operation.

There are, however, a few drawbacks to leaving the needle *in situ* throughout the analgesia period. These drawbacks were overcome by inserting a Polyethylene Catheter through the spinal needle, and then removing the needle, leaving only the catheter in the canal.

In caudal analgesia the catheter is least likely ever to penetrate a low-lying dura and cause an inadvertent spinal instead of an epidural analgesia. After the catheter is inserted and held in

place with adhesive plaster, there is no chance of its coming out through the movements of the patient. There is no danger of a needle breaking during the turning of the patient. The patient can be turned easily from side to side and she may lie comfortably on her back, a position in which one hesitates to place the patient while a needle lies in the caudal canal. If it is desired to continue the analgesia during the delivery, the patient may be transported with perfect safety, without risk of dislodging the catheter.

Advantages in Fractional Analgesia

Fractional spinal analgesia with the catheter method also offers distinct advantages. A special table mattress is not necessary, as is the case with the needle technic. Once the catheter is in the subarachnoid space and fixed with adhesive plaster, the patient may lie on her back with no danger of dislodgment.

In our work, we chose Polyethylene tubing, which was animal-tested, in appropriate size to go through a 17-gauge needle. We buy the catheter tubing in rolls of 100-foot lengths and cut them into 36- to 40-inch lengths for caudal or fractional spinal use. The length is a matter of choice and convenience. We have not noticed any spinal canal, caudal canal, or other tissue reaction to animal-tested Polyethylene tubing.

You may be interested...

- The use, at Bellevue Hospital, of the Ayre wooden spatula for cytological diagnosis of early carcinoma of the cervix, is favorably reported on in *S, G & O,* Dec., 1950, pp. 728, ff.
- Various-sized couplers for attaching polyethylene tubing to Luer-Lock syringes are available from Clay-Adams.
- Two motion pictures may be rented at a nominal fee from Clay-Adams: "Precancer Diagnosis of the Cervix by Cytology," by Dr. J. E. Ayre; and "Obstetrical Maneuvers on the Ayers Manikin," by Dr. H. E. Ayers and Dr. J. Mussio.

Newsletter

FOR THE MEDICAL AND BIOLOGICAL SCIENCES

Reproducible Blood Counts Require Accurate Mixing

Accurate, reproducible blood counts are possible only if the blood sample and diluent are homogeneously mixed in the blood pipette. YANKEE Pipette Shakers do this in *30 seconds:* far less time and far more accurately than by hand-shaking.

Carefully engineered to give consistently uniform blood counts, YANKEE Pipette Shakers gently rock blood pipettes through a controlled ¼-inch arc in the vertical plane. Horizontal motion is practically eliminated. The rocking arm is motor activated, not vibrated, at a rate of 1550 lateral oscillations per minute.

If the blood-counting chamber is charged immediately after shaking, reproducible blood counts well within the normal margin of error are consistently obtained. The soft circular motion of the pipette beads does not hemolyze the blood cells.

YANKEE Pipette Shakers are available with interchangeable heads to hold two or six pipettes. An adjustable timer automatically cuts off the motor at the end of a 30- to 60-second shaking period. Ruggedly built for long service, YANKEE Pipette Shakers occupy only 5 x 5 x 3½ inches of table space. Rubber suction feet prevent creeping even on the smoothest surface.

Pertinent Questions on R. I. germicide

Visitors to our booth at the recent meetings of the American College of Surgeons, American Society of Clinical Pathologists, and American Public Health Association posed questions about our new Rust Inhibiting germicide. We feel that many of their questions will interest our readers.

Question: Is R. I. germicide a sporicide?
Answer: No. It is a cold germicide with a high germicidal efficiency against many types of pathogenic organisms, but not against spores. If complete sterilization is necessary, we recommend steam sterilization and subsequent storage in R. I. germicide to maintain sterility.

Question: How long can instruments be left in R. I. germicide without dulling the cutting edge?
Answer: Indefinitely. Our own tests reveal that a scalpel left in R. I. germicide for six months shows no pitting or loss of cutting edge in contrast to ordinary germicides.

Question: Must the rust inhibitor be renewed?
Answer: No. R. I. germicide is *permanently* rust-inhibiting. Its germicidal and rust-inhibiting properties remain unchanged until altered by contamination or overdilution.

Question: Can R. I. germicide be used in hard-water areas?
Answer: Yes. Each 10 ml. ampule of R. I. germicide is diluted with ordinary tap water, either hard or soft, to make one quart (or liter) of working solution.

Question: How long must instruments be left in the solution for proper disinfection?
Answer: We recommend that instruments and appliances be left in R. I. germicide for at least 5 minutes before reusing.

SPECIAL LITERATURE AVAILABLE

Detailed descriptions on the following may be obtained from Clay-Adams on request by number:

Caudal and Spinal Analgesia Technics	Form 504
R. I. germicide	Form 503
Polyethylene Tubing and Accessories	Form 447B
YANKEE Pipette Shakers	Form 496A

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prompt, quiet recovery . . .
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Literature will be mailed upon request.

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An Inhalation Anesthetic for Short Operative Procedures

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Here at last is the autoclave for every office—the Castle "777" Speed-Clave. It's faster than boiling, easier than boiling, safer than boiling, and cheaper than boiling. The security of 100% sterilization—which only an autoclave can give—now becomes practicable for every office in this compact, fast, inexpensive, automatic autoclave.

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The Speed-Clave reaches the spore-killing temperature (253°F., 16½ lbs.) from a warm start in 3 minutes. Instruments are then 100% sterile in 10 minutes (6 minutes at 260°F., 20 lbs.). Compare this with the time required to start a boiler, with at least 10 minutes more to kill only common bacteria, not spores.

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Complete safety in every office is now possible at no higher price than a modern cabinet model boiling sterilizer. What's more, the Speed-Clave provides economical sterilization. You can buy unsterile dressings (about a 40% saving), and instrument replacement is reduced—less dulling, rusting, and corrosion of instruments.

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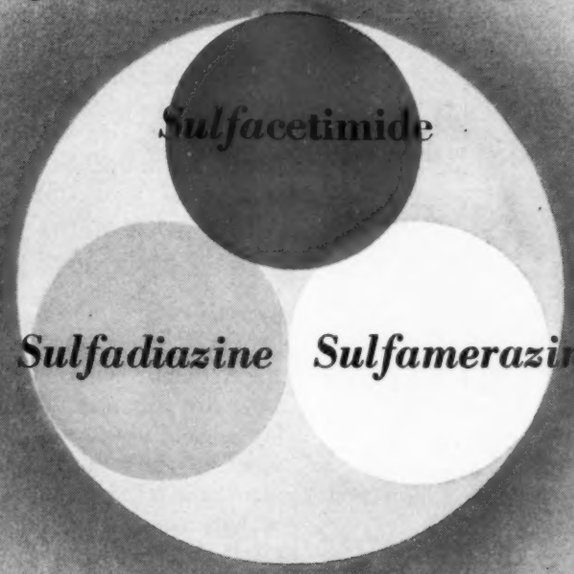

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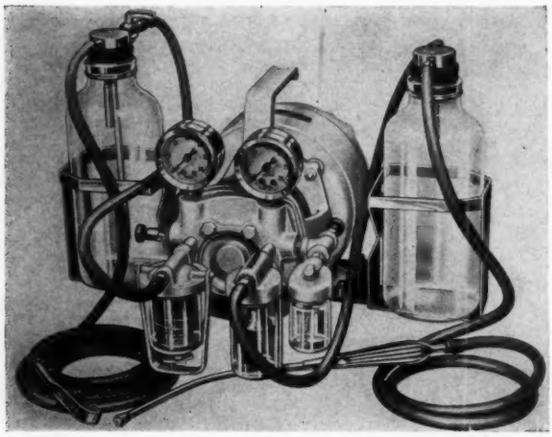
SCHERING

Outside the Ivory Tower

SINCE 1850 life expectancy has increased twenty-seven years. For the first time in history, syphilis is definitely on the decline. In industry the accident rate shows a drop of 7 per cent. Formidable surgery of twenty years ago is commonplace today. These and hundreds of other facts come to light in the 1950 edition of "Health Instruction Yearbook," edited and complied by Oliver E. Byrd, just published by Stanford University Press.



THE addition of a new, proven, ether-anesthesia-suction pump to their line has been announced by The Max Wocher & Son Co., Cincinnati, Ohio. It is stated that the new pump-unit, the Southwind, will give years of satisfactory service either as the principal anesthetic machine or as an auxiliary. Quiet as a whisper, but powerful as a giant, the Southwind is a full-sized unit. Clean, filtered air flows to the ether-bottle under the precise control of a convenient escape valve. The ether bottle has an additional volume regulator. The suction inlet has an automatic trap that cuts off the pump should liquids enter the trap bottle. Degree of suction can be regulated. Automatic oiling permits long use with a minimum of attention. Oil feeds only while pump is running. It is complete as illustrated, with Gauges, Williams Suction Tube and Ether Hook. It has a convenient carrying handle. Further details are available from The Max Wocher & Son Co.

A NEW virus strain which affects children and may prove to be another type of influenza has been found in a recent epidemic of acute respiratory disease by the Armed Forces Epidemiological Board, the Department of the Army announced. The new strain was discovered during an investigation conducted earlier this year in Michigan by the board's Commission on Influenza, which operates under the auspices of the Army Surgeon General. The recently discovered virus, which could be called Influenza C, was isolated during a mild outbreak of influenza associated with A-prime strains of virus. The epidemic occurred in Michigan last spring. Studies up to the present have disclosed two clear-cut categories of influenza, A and B, as well as some rather pronounced differences between sub-strains belonging to each of the types. Efforts to relate the virus to other known respiratory diseases were unsuccessful. Studies with animal serums failed to show a relation to known influenza virus, to Newcastle disease virus, to mumps virus, the Texas, Ohio and Connecticut strains of Coxsackie virus, or to the pox groups of virus. All tests showed negative results to these common infectious diseases, indicating that the newly discovered virus seems to be distinct from previously identified strains of influenza virus.

THE borough of Manhattan leads the city in tuberculosis incidence and mortality. Godias J. Drolet, Consultant Statistician of the New York Tuberculosis and Health Association, reports that during the first six months of 1950 there were 1,264 deaths from tuberculosis in New York City; half (610) were residents of the borough of Manhattan. Of the 4,226 new cases of tuberculosis registered in the city during this period, 2,075 were residents of Manhattan. In relation to the population of the various boroughs as just enumerated by the Census Bureau the registration of new cases of tuberculosis in the City of New York during the first half of 1950 averaged 107.7 per 100,000 population. The average for Manhattan was 213.9. In the Bronx the incidence rate for new cases was 76 per 100,000 population as compared with 59 in Queens. The number of new cases registered by the Department of Health of the City of New York show that on an average 160 new victims of tuberculosis are still being brought down every week.

(continued on page 28)

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

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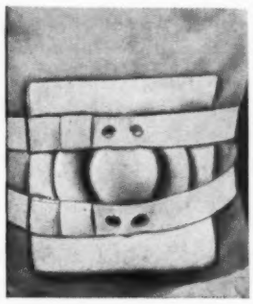
THE TRASK COLOSTOMY DOME, the only appliance that uses the 33 ply cellu-cotton disposable receiving pad. A new fresh pad after each movement keeps the patient immaculate at all times.



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If your dealer cannot supply your patients, order direct but be sure to mention your dealer's name.
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Extremely useful in the treatment and prevention of contracted anus (particularly following hemorrhoidectomy), as an aid in perineal dissection and repair following delivery.
Sold only on prescription—at your surgical dealer or ethical pharmacy.
Adult Set sizes 1, 1½, 2, 3—for stretching anal sphincter.
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Outside the Ivory Tower

(*continued from page 26*)

THE Shampaine Company announced that controlling interest in the W. D. Allison Company of Indianapolis, manufacturers of fine physician's furniture and dental cabinets, was acquired on December 1, 1950. Individual sales policies of the Shampaine and Allison Companies will continue to be determined and handled separately and independently. Sales forces, however, will be merged to provide increased efficiency and better service for all dealers.

FOSTER G. McGaw, president of the American Hospital Supply Corporation, announced ground breaking for a new $400,000 warehouse and office building in Flushing, L. I. It will better serve the Eastern area and enable the New York division to stock and ship to all divisions and foreign markets many items purchased in the East that are now handled by the headquarters plant in Evanston. The building will be of Gothic architecture, at considerable extra cost, in order to add a decorative appearance because it is located near a residential neighborhood.

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BY timing and coordinating their hospitality, fourteen American business firms completely defrayed one substantial expense item, meals, for scores of foreign physicians who, financially limited in America by the dollar shortage of their respective countries, attended the five-day General Assembly of the World Medical Association beginning here October 16th in the Hotel Roosevelt. Other prominent business concerns have also combined to leave with each of the 120 wives accompanying their physician-husbands from widely separated parts of the world, a gift symbol of good will and of "America's free economy with all its abundant rewards." The carefully blueprinted hospitality took the form of an unbroken series of luncheons and dinners throughout the convention period.

A PROMISING new type of the mold which is the source of penicillin has been developed at the University of Wisconsin and released for trial to the penicillin industry. The new type of penicillin produces a pigment-free drug which simplifies purification. The new variety has been named Wis. 49-133 and was discovered in the course of fundamental studies on variability in the penicillin-producing fungi by Professors Myron P. Backus and J. F. Stauffer of the department of botany. The new strain of the penicillin organism is a descendant of the famous Q-176, developed during the war by Professors Backus and Stauffer, which made a doubling of the world's penicillin production possible without increasing the number or size of manufacturing plants.

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(*continued on page 36*)

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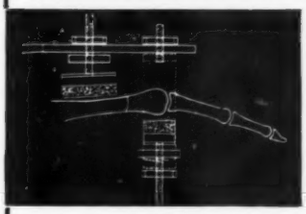

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(1) Mosenthal, H. O.: Management of Diabetes Mellitus: An Analysis of Present-Day Methods of Treatment, Ann. Int. Med., 29:79 (July) 1948.

(2) McLester, J. S.: Nutrition and Diet in Health and Disease, 5th ed., Phil., W. B. Saunders Company, 1949, page 364.

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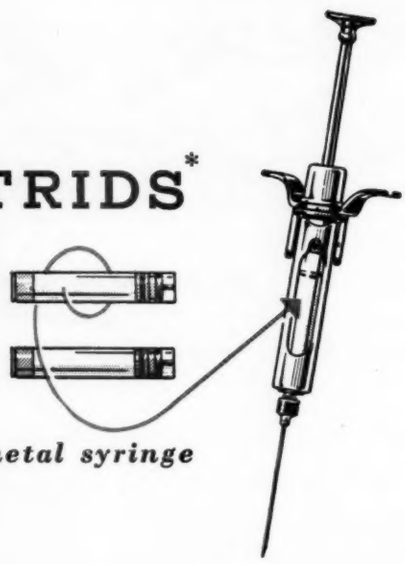

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A PRACTICAL JOURNAL BUILT ON MERIT

Sixtieth Year of Publication

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Editorial

A PLEA FOR BEDSIDE NURSE TRAINING*

WE want progress. We need an orderly evolution and not a revolution. By orderly evolution progress can be made without disturbance. Revolutionary changes find us unprepared for the obligations ahead and experiments, if unsuccessful, may lead to undesirable consequences.

The present trend in nursing education is to create nursing education schools within Universities and to train subsidiary groups of trained practical nurses for bedside nursing. The hospital school of nursing which has been preparing nurses for bedside nursing may have to go out of existence.

No one would decry the importance of nursing education, but one can seriously question whether it would be possible to supply the public needs for bedside nursing through a prolonged educational system. It is important to realize that in general education the leaders have clearly shown that all of us are not "college material." We must have in nursing, as in all well organized service groups, those who lead and teach and those who proudly render service. Let no one belittle those who stand by the bed and who, under supervision of the doctor in charge, aid in the battle for recovery of the individual. No one will deny the need for sociologists, social workers, community health workers and psychologists. The individual trained to be a bedside nurse does not need prolonged college training to be an efficient ally of the doctor in the battle for the recovery of the acutely ill individual.

In the changing scenes of today we have arrived *at a time of decision*. It is important to decide whether we are to have two types of training schools for nurses. Is the program to be a patient-centered nursing program or is it to be a nurse education–centered program?

Are we to have nursing education institutions as distinct departments of universities or will we continue to have hospital training schools which will attempt to coordinate nursing service and nursing education. The primary purpose of the hospital school should be to train nurses to give the best possible nursing service. Institutions whose primary function is education should provide training for those who would be directresses, supervisors and nursing educators.

We are faced with many serious facts. There are at the present time over 1,600,000 hospital beds in the United States. There were over 16,000,000 admissions to hospitals during 1949. Are the universities prepared financially and have they physical plants and faculty to staff such institutions?

Will highly educated individuals be willing to do bedside nursing or will we see them willing only to take executive positions in hospitals, teaching positions in colleges, public health positions and positions as psychologists to child guidance clinics; or will they, as has been suggested, be willing only to devote themselves to research problems and to writing?

What will be the effect upon the acutely sick in hospitals? There is already a trend to

* Address to the Graduating Class, Baton Rouge General Hospital, Baton Rouge, La., July 17, 1950.

develop practical nurse training schools. Those who take these courses will be considered as auxiliary workers and subordinates to the so-called professional nurse. One asks himself: What is the future of the present group, the registered nurses who have had three years of preparation in hospitals?

I made the statement that this is the time of decision. The basis for discussion for a long time will be a report prepared for the National Nursing Council by Dr. Esther Lucile Brown, Director of the Department of Studies in the Profession of the Russell Sage Foundation in 1948. In the introduction Dr. Brown, a Doctor of Philosophy, not a nurse or a doctor of medicine, states, "For a quarter of a century leaders of nursing education have striven to create a sound and socially motivated form of *nursing education*. Long ago they became convinced that a system of apprenticeship, such as existed in the majority of the training schools was no longer adequate to prepare nurses either for the increase of institutional nursing or for that vast new field of community nursing which was in process of development."[1]

The following are brief abstracts of the Brown report which may be of interest:

"The fact has long been apparent that there are proportionately too few nurses prepared to give more than general bedside care. . . . Many thoughtful persons are beginning to wonder why young women in any large numbers would want to enter nursing as practiced or schools of nursing as operated today. . . . By no conceivable stretch of the imagination can the education provided in the vast majority of some 1,250 schools be conceived of as professional education. In spite of improvements that have been made in most schools over the years, it remains *apprenticeship training*. . . . Many hundreds of hospitals still operate schools, as they have in the past, to avail themselves of the services of student nurses. Regardless of the improvements that they have been forced to make by the trend of the time, their primary interest is not in education. *Were such hospitals vividly interested in professional development they would tomorrow relinquish their schools to auspices whose exclusive function is education.*"

Under the heading of Education for the Professional Nurse in the Brown report we find the following:

"Almost without a dissenting voice those who are conversant with the trend of professional education in the United States agree that *preparation* of the *professional* nurse *belongs squarely* within *the institution of higher learning*. It is important that the school be accorded the same recognition as other professional schools, and that the director be given the status of Dean and a seat at the conference table on the highest executive level. . . . The university school should enter into relations with other institutions exclusively to obtain necessary clinical laboratories, *and not to help provide nursing service for patients*. . . . Because professional education in nursing has to be built almost from the ground up in many parts of the country, supplementary federal assistance is viewed by a large proportion of informed nurses as necessary and desirable. . . . As a goal toward which to work during the next decade, we recommend that efforts be directed to building basic schools of nursing in universities and in colleges comparable in number to existing medical schools, in a sound organization and financial structure, adequate in facilities and faculty, and well distributed to serve the needs of the entire country."

In summary, one will note that emphasis is laid on nursing education and not on nursing service. The report recommends the establishment of independent schools of nursing education within the university. The need for providing these facilities will necessitate a building program, both physical and faculty, and recommendations are made that efforts be made to obtain federal and state funds for these purposes.

Even if the suggestion of the university level of education were to be carried out, it would not be possible to provide an adequate number of "professional nurses" with degrees for nursing service.

The Director of Nursing Service at Vanderbilt University clearly stated her position:[2] "A concept of hospital nursing service, the functions it fulfills, and its program of work evolve from the organization in which it is placed and the objectives inherent in the organized purpose. The objects in our situation are education, research and service. *The school of nursing is*

[1] Brown, Esther Lucille. Nursing for the Future, p. 11–181. Report to the National Nursing Council of the Russell Sage Foundation, 1948.

[2] Holtzhausen, Erma A. Nursing service in a teaching hospital. *Am. J. Nursing*, 46: 550–554, 1946.

no part of our hospital organization; this is the first factor in liberating it from the weakness that for years hampered nursing education. In nursing education the student is at the center of the program, whereas hospital nursing service revolves about the care of the patient. In teaching hospitals nursing service should be evaluated on a different basis from that in non teaching hospitals where practically the entire time of ward nurses is given to care of patients."

It should be noted that Miss Holtzhausen has emphasized that the system or organization of a particular institution is dependent on its objectives. Even though educators have decried the "in-service" or apprentice type of nursing, Miss Holtzhausen states specifically, "The worth of learning by doing is still an undisputed principle in nursing education but, it is the misuse of this principle in terms of money saving to the hospital that has frustrated the best interests in nursing education."

In spite of the insistent demands that "the modern hospital must relinquish its control of nursing education to institutions whose primary purpose is education"[3] and in spite of the fact that committees and councils to study nursing education are agreed that the three-year hospital school of nursing must be eliminated, we find some voices raised in favor of hospital schools which are attempting to train nurses for bedside care particularly.

J. Milo Anderson[4] in a recent article in *Modern Hospital* stated, "It is not necessary to destroy the present system or to make the registered nurse a displaced person in order to improve nursing education." Anderson and others agree that nursing education for service can be improved. Anderson said, "Bedside nursing is a skill which must be learned and taught largely by the apprentice method. Supervised clinical experience is an important part of the nursing curriculum and must be given proper emphasis. This can and is being done well in hospital schools."

The value of bedside instruction is emphasized by Miss Margaret Conrad, Associate Dean and Director of Nursing, Columbia Presbyterian Medical Center, New York:[5] "Group instruction and class demonstration have a vital place in any educational system, but the best education for patient care takes place with a wise and experienced nurse on one side of the patient and a novice on the other. The fundamental principles of nursing and health become effective at the bedside or in the clinic or in the hospital. No amount of pressure should shake one's firm conviction on this point."

Sister Henrietta, Director of the School of Nursing Service at Charity Hospital in New Orleans in 1948, said, "The nursing department which we are going to organize will be built to serve the patients; in other words it will become a patient centered department. The statement is heard frequently that better education of students will result in better care of patients. But, does it?"[6] One of her concluding remarks was, "When as much emphasis is placed on standards of nursing care as is placed on nursing education, I think that we can hope for improvement. The first requirement for establishing a patient-centered nursing department is to grasp the idea of nursing service as an entity unto itself. The place where nursing service and nursing education overlap, namely in the clinical experience of the student, is the scene of a host of problems. Our nursing service needs are taking precedence over the aims of the nursing school. Leadership in nursing service demands expertness in bedside nursing along with the other qualifications needed by an executive."

Let it not be forgotten that hospitals, the medical staffs and the public in need of nursing service are vitally interested in the preparation of those who are to aid the physician and surgeon in his work. The hospital in its desire to render service and the public who are to receive this service are not unmindful of the training of the nurse.

Nursing educators should not be unmindful of the fact that the surgeon has more to lose than anyone except the patient himself when poor nursing service is rendered.

In 1947 the American Surgical Association after a study of the nursing problem concluded,[7] "The opinion is widely held that the profes-

[3] PIKLER, GENEVEVE, and PIKLER, ROY. *Mod. Hosp.*, September, 1949.

[4] ANDERSON, J. MILO. The degree doesn't make the nurse. *Mod. Hosp.*, 73: 56–60, 1949.

[5] CONRAD, MARGARET. *Am. J. Nursing*, 49: 110–112, 1949.

[6] SISTER HENRIETTA. Organizing the nursing department to serve the patient. *Am. J. Nursing*, 48: 285–287, 1948.

[7] NAFFZIGER, HOWARD C. Report of the Chairman. *J. A. M. A.*, 133: 1168–1169, 1947.

sional aim of the nursing profession has been to elevate the nursing profession and to increase the educational content of training. They have lost sight of the need of the sick for adequate nursing care. As more of the nurse's time has been devoted to formal class instruction, the nursing care of the patient has become less satisfactory. There was almost complete unanimity in the feeling of the surgical profession that the increase in the required training for nurses beyond the three year level has not improved their ability to care for the sick and that it had not promoted closer cooperation between the doctor and nurse in the care of the sick. The need for adequate bedside nursing care is manifest and urgent; and whereas, there is no indication that these needs will be met by established schools of nursing; and whereas, it is the concensus of this body that experience has shown that prolonged periods of education are not essential for the training of bedside nurses; therefore, be it resolved that the American Surgical Association go on record as approving the use of personnel trained specifically for bedside care and, be it further resolved, that it urge the immediate establishment of short courses for the training of bedside nurses."

The American Medical Association in 1948 advocated two main classes of nurses, namely, professional nurses and trained practical nurses. The professional nurse group was to be subdivided into nurse educators and clinical nurses. The clinical nurse was to be comparable to the present day general duty or private nurse. The committee recommended that the course of training for the clinical nurse be reduced to two years. They recommended that uniform standards of training for trained practical nurses be developed. They also recommended one year of training of which three months were to be for theoretical and nine months for practical training.

It is evident that if the trend of nursing education for the professional nurse continues to develop, the present general duty nurse or registered nurse will be almost completely displaced by the so-called practical nurse.

As a middle-of-the-road individual who believes in looking upon things in a realistic way, let me remind you that it will not be possible over night or in a decade to finance and build both physical facilities and faculties for university level independent nursing schools. It is true that suggestions have been made that federal aid be obtained. I, for one, hope that from the "cradle to the grave" paternalistic type of government for regimentation of education and other activities of life will not soon be a reality.

So much criticism has been leveled at the in-service or apprenticeship type of training of nurses that it might be worth while to discuss this briefly.

There was a time not so long ago when the medical curriculum was largely filled by didactic lectures. Today bedside clinical clerkship and supervised training has largely replaced didactic lectures. Even graduate training in medicine is largely based today on supervised in-service experience. In our great public institutions the medical staff seeks added experience and training for themselves long after they have become recognized in their particular special fields. No amount of didactic or laboratory training can ever be a substitute for clinical experience under supervision at a bedside. No amount of psychologic didactic teaching or reading can replace the opportunities gained by study of the patient and his family under trying and distressing conditions. If this method of training is good for students of medicine, it should be good for nurses.

I am reminded of the story of the distinguished scientist who went out in a boat with fishermen. The men rowed for a few minutes when the scientist said to the fishermen, "Have you ever studied astronomy?" One poor fisherman did not know what astronomy was and of course he said, "No." The scientist then asked if the fisherman had ever studied geology. He replied in the negative and the professor said, "You have missed half of your life." Just about that time the fisherman saw a squall coming up and he turned to the professor and said, "Have you ever studied how to swim?" The professor said, "No" and the fisherman replied, "Then you have missed your whole life."

I trust that you see in nursing a vocation dedicated to human service. It is the hope of your friends that you of the graduating class will use your training for the benefits of mankind. May your efforts bring happiness to those entrusted to your care and may each of you enjoy the satisfaction that comes from duty well done.

ISIDORE COHN, M.D.

American Journal of Surgery

Original Articles

PSEUDOCYSTS OF THE PANCREAS

KENNETH B. BRILHART, M.D. AND JAMES T. PRIESTLEY, M.D.
Fellow in Surgery, Mayo Foundation — Division of Surgery, Mayo Clinic
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RECENTLY we encountered several patients who had what is commonly known as "pseudocyst of the pancreas." We were stimulated by certain questions which arose in our minds regarding the etiology, diagnosis and treatment of this condition and decided to review the cases of this condition encountered at the Mayo Clinic. Forty-four cases were studied and it was found that each patient had had a pseudocyst of the pancreas and had received surgical treatment during the years 1935 through 1947. Many of these patients were operated upon by our surgical associates. Because of the fact that this lesion occurs rather infrequently, no one surgeon has had extensive experience with the condition.

There are many articles in the literature concerning cysts of the pancreas. A number of these report a single case[3,7,11] or discuss cysts or cystic conditions of the pancreas other than pseudocyst.[5,10,23,34] Some of the more extensive studies which deal largely with pseudocysts of the pancreas are those of Judd,[16] Thigpen,[33] Judd, Mattson and Mahorner,[17] Brunschwig,[4] Rabinovitch and Pines,[29] Jones[15] and Holt.[12] Pinkham,[27] Friedenwald and Cullen,[9] Koucky, Beck and Todd,[19] Adams and Nishijima,[1] Meyer, Sheridan and Murphy,[25] and Poer and Stephenson[28] have also contributed to this field. Numerous other authors have reported a few cases or discussed various aspects of pancreatic pseudocyst.[14,18,22]

CLASSIFICATION OF PANCREATIC CYSTS

Numerous classifications of pancreatic cysts are found in the literature. As with other conditions the simplest and most practical classification is of the greatest value. Such a classification has been suggested by Thigpen as follows: (1) pseudocysts (traumatic, inflammatory); (2) retention cysts; (3) neoplastic cysts (cystadenomas, cystadenocarcinomas, sarcomatous, teratomatous); (4) congenital cysts; (5) parasitic cysts; (6) miscellaneous pancreatic cysts. We are using this classification in our consideration of pancreatic cysts.

Pseudocyst of the Pancreas. As the name implies this is not a true cyst which develops within and is surrounded by pancreatic tissue. Actually it is a collection of material of a more or less fluid consistency usually adjacent to but occasionally within the pancreas which may result from inflammation or trauma. Such a cyst is surrounded by a sac which does not have a lining epithelium, in contrast to a true retention type of cyst. In our experience a pseudocyst is one of the most common types of cysts associated with the pancreas.

Retention Cysts. As the name implies these cysts contain the external secretion of the pancreas. Cysts of this type are commonly thought to arise because of obstruction of one of the more important pancreatic ducts although in the experimental laboratory complete ligation of the main pancreatic duct usually results in atrophy of the pancreas, except for the islets of Langerhans. Cysts of this type have been reported to occur after trauma,[6] chronic pancreatitis[21] and pancreaticolithiasis.[2] It has been suggested that such a cyst might result from a stone in the lower end of the common duct which obstructs the pancreatic duct. Etiologically such a cyst seems comparable in some ways to hydronephrosis in that sudden complete obstruction of the ureter results in renal atrophy whereas continued incomplete ureteral obstruction leads to dilatation of the pelvis and calyces of the kidney. It is, of course, of some importance to distinguish between a pseudocyst and retention cyst at the time of operation as indications for treatment may differ. The wall of a retention

cyst is thin, seldom more than 1 mm. in thickness, and is lined with epithelium in contrast with the wall of a pseudocyst. Of all types of cysts the retention cyst is probably the one which is most likely to be confused with a pseudocyst partly because of atrophy of the epithelial lining which may occur owing to continued pressure within the cyst.

Neoplastic Cysts. These cysts, which are usually multilocular, generally present a gross appearance suggestive of neoplasm. As a rule biopsy of a small specimen from an appropriate area settles the diagnosis. Occasionally cysts are seen in association with carcinoma of the pancreas, five such cysts being reported in a series of eighty-five cases of pancreatic carcinoma reported by Eusterman and Wilbur. Cystadenoma is the most common neoplastic cyst of the pancreas with cystadenocarcinoma being the next most frequent type. Sarcomatous and teratomatous cysts are rather uncommon.

Congenital Pancreatic Cysts. Only a few cases of dysontogenetic cyst[26] have been reported. This cyst which arises from a developmental anomaly contains all three of the pancreatic enzymes, but because of its etiologic background it is not considered an ordinary type of retention cyst. Parasitic cysts are rare in the United States but occur more frequently in certain tropical and other countries.

Miscellaneous Pancreatic Cysts. In this category are such types of pancreatic cysts as cystic hemangio-endotheliomas, cavernous hemangiomas and epidermoid cysts.

CLINICAL ASPECTS

The fact that a correct preoperative diagnosis of pancreatic cyst has been made in only a minority of the cases is sufficient evidence that the clinical findings associated with this lesion have not always been accurately evaluated. It seems possible, however, that this condition may be detected preoperatively in a higher percentage of cases if a careful history is obtained and the examining physician is familiar with the symptoms and findings that are commonly associated with the lesion.

Age and Sex. Although certain authors have reported that pseudocyst of the pancreas occurs oftener among women than men, in our series of forty-four patients there were twenty-five men and nineteen women. An equal incidence among men and women was noted by Meyer, Sheridan and Murphy in a series of thirty-one cases. The most common age at which the diagnosis was made was between thirty and sixty years although four patients were younger and six were older. The average age was 46.4 years.

Etiologic Aspects. Seventeen of the forty-four patients had undergone abdominal operations previously. Five of these seventeen patients had undergone cholecystectomy. Definite induration of the pancreas of an additional four of the seventeen patients was noted; nothing further was done and the abdomen was closed. The exact nature of the previous abdominal operation of another four patients was not known. The remaining four patients in the group of seventeen had undergone various unrelated procedures.

The two etiologic factors most commonly associated with the development of pseudocyst of the pancreas are pancreatitis and trauma. Pancreatitis is the cause oftener than trauma. In only two of our forty-four cases was antecedent trauma significant. Lazarus has produced a pseudocyst by crushing the pancreas of the dog. Originally a hematoma developed and subsequently a collection of 100 cc. of milky fluid was found in the region. It would appear likely that this may be the sequence of events when a cyst develops after trauma. Under these circumstances the cyst may be adjacent to or actually within the pancreas. There may or may not be pancreatic enzymes in the contents of the cyst, depending on the amount of trauma to the parenchyma and the ductal system of the gland. At other times hemorrhage into the lesser omental sac or other areas immediately adjacent to the pancreas may ultimately result in a cystic collection in proximity to the pancreas which may be designated as a pseudocyst of the pancreas. Pancreatic enzymes probably would not be present in the contents of the cyst. Trauma, however, may result in a true retention type of cyst. In a group of 128 cases of pancreatic cyst of all types collected from the literature Schmieden and Sebening found a history of trauma in only sixteen cases (12.5 per cent). In a similar group of 117 cases Körte reported previous trauma in thirty-three cases (28.2 per cent). Others have reported trauma as an etiologic factor in a much smaller percentage of cases.[1,16,17,29,31,32] It would seem rather difficult to evaluate accurately the exact frequency of trauma as an etiologic factor because of the

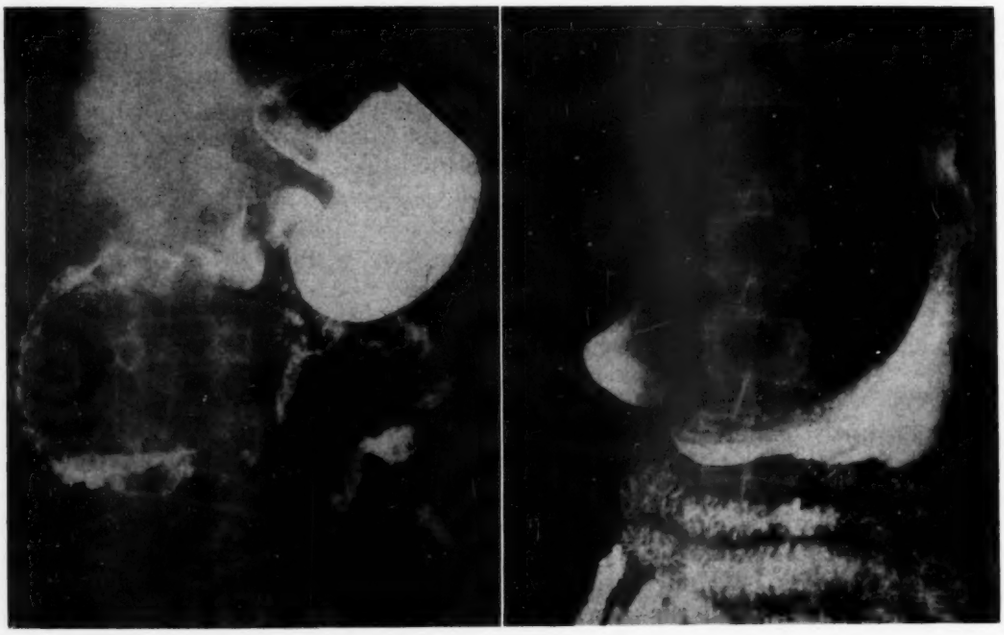
possible omission of this consideration when the history is taken and the uncertainty in evaluating the significance of varying degrees of trauma. Obviously, many people who have received a blow of some type in the upper part of the abdomen have not suffered subsequent ill effects.

Inflammation of the pancreas is thought to be the forerunner of a pseudocyst oftener than trauma. Söderlund, for example, reported cases of five patients and Stoll of three patients, all of whom had cysts which had developed in association with acute or subacute pancreatitis. Other authors[17,27,33] have noted that an inflammatory reaction in the pancreas may precede the development of a cyst. Definite evidence of pancreatitis was known to exist in twenty-one of the forty-four cases in our series. It has been suggested that disease in the biliary tract, particularly calculi, may be a factor in the development of pseudocysts in the pancreas because of the relative frequency with which abnormal findings in the biliary tract have been found in association with a pancreatic lesion of this type. It appears unlikely, however, that this relationship is a direct one. In some cases there is no apparent cause for the development of pseudocyst of the pancreas.

Symptoms. Pain is by far the most common symptom of pancreatic pseudocyst. Thirty-eight of the forty-four patients in our series complained of pain. Undoubtedly pancreatitis, which is so frequently the precursor of cystic formation, is one of the causes of pain in many cases, and the character and location of the pain are typical of pancreatitis. Thirty of the forty-four patients had severe pain and twenty-four patients had pain severe enough to require hypodermic medication. Eight patients had mild or moderate pain. Six patients were without pain but each of these had a palpable mass in the upper part of the abdomen. Most patients had constant pain during an attack but three had pain of a colicky nature. In twenty-four of twenty-six cases in which duration of the attacks of pain is definitely known pain persisted for more than ten hours and in one case it lasted more than a week. The frequency of attacks varied considerably from one case to another and also in the same case. Some patients had attacks of pain only once or twice a year but others had attacks as often as every two weeks. Location of pain at the time of onset was usually epigastric but in a few cases it was primarily in the right upper abdominal quadrant or occasionally in the left upper quadrant; in three cases it was diffuse across the back. In one instance it was centered around the umbilicus. Commonly the pain extended through to the back at about the level of the pancreas (eighteen cases). In fifteen cases there was no extension of pain; in a few cases it extended to the left upper quadrant. Acute perforation of a pseudocyst of the pancreas with sudden severe pain has been reported;[19] however, this is a most unusual complication. Various positions were assumed by the patients to obtain at least partial relief of the pain. Commonly the patient would bend forward, but occasionally lying down, sitting up or assuming the knee-chest position offered some relief. About half of the patients had residual soreness after cessation of severe pain; this soreness lasted from several days to a week. Dyspepsia characterized by excessive gas and bloating was not uncommon.

Physical Findings. Recent loss of weight is common. Jaundice may or may not be present. If it occurs it is obstructive in type and is caused by pressure on the common bile duct. The pressure usually is caused by the cyst but occasionally is caused by associated pancreatitis or calculous disease in the biliary tract. Thirteen of the forty-four patients evidenced definite jaundice and ten of these had a palpable mass.

Of the entire group of forty-four patients, thirty-two had a palpable mass at the time of examination; it is apparent, therefore, that such a finding is the rule rather than the exception. In some cases the cyst may be too small to palpate through the abdominal wall. The mass when present was found in the upper half of the abdomen in all cases. In approximately one-half of the cases it was found in the left upper abdominal quadrant. The epigastrium and right upper abdominal quadrant, respectively, were the next most frequent sites. Frequently a mass had been noted by the patient prior to the time when he first consulted a physician. Commonly this had been present for only a short time but a few patients had noted the presence of a mass several years previously. In some cases the mass was present only during acute attacks of abdominal pain and disappeared between attacks. It varied significantly in physical characteristics being soft and tender in some cases and hard and non-tender in other cases. Likewise the size



1 2

FIG. 1. Widening of duodenal loop caused by pseudocyst of the pancreas.
FIG. 2. Downward displacement of stomach caused by pseudocyst of the pancreas.

of the mass varied roughly from that of a lemon to that of a grapefruit. Some masses moved with respiration but usually they were relatively immobile. A pancreatic cyst which presents as a firm, non-tender, immovable mass may readily be confused with a malignant neoplasm on physical examination so that physical characteristics of the mass should not constitute a deciding diagnostic factor. We recently saw a patient who had a large, firm, immovable mass in the right upper quadrant of the abdomen associated with painless jaundice, but at the time of exploration a pseudocyst of the pancreas was found.

Laboratory Findings. Six of the forty-four patients were found to have diabetes, an incidence high enough to be significant. This may result from extensive and long-standing chronic inflammatory changes in the pancreas and often is associated with evidence of external pancreatic insufficiency. Likewise controlled studies of intake and excretion may reveal an excess of fat and nitrogen in the stool indicative of an insufficiency of external pancreatic function. In twelve of twenty cases in which blood amylase was determined values were above normal, whereas in only two of twelve cases in which blood lipase was estimated was this value found to be above normal. Had these examinations been made during episodes of acute pain in all instances it is possible that a higher percentage of elevated values would have been found; however, when extensive destructive changes have occurred in the pancreas, values of these enzymes may not be elevated during acute attacks.

Roentgenologic study may reveal significant or contributing evidence of pancreatic disease. For example, a mass of soft tissue was noted in the upper part of the abdomen of each of sixteen patients. Six patients had evidence of calcification in the region of the pancreas. A non-functioning gallbladder was diagnosed in six cases and stones were found in the gallbladders of an additional three patients. Holt has emphasized the diagnostic importance of widening of the duodenal loop as a diagnostic sign of a cyst located in the head of the pancreas. (Fig. 1.) Displacement of the stomach or indentation of the greater curvature may be caused by a cyst in the body or tail of the pancreas although these findings are not pathognomonic of pancreatic cyst. (Fig. 2.)

Preoperative Diagnosis. A clear appreciation of the clinical picture which usually is presented by the patient who has a pancreatic cyst would seem to lead to an accurate preoperative diagnosis in the majority of cases.

In the past, however, this has not been true. For example, in our series of forty-four cases pancreatic cyst was diagnosed before operation in only nine cases. Among various diagnoses included were carcinoma of the pancreas, pancreatitis, cholecystitis with stones, stone in the common duct and "abdominal tumor." Important features of diagnosis included either a history of severe trauma in the region of the pancreas or recurrent attacks of pain in some portion of the upper half of the abdomen perhaps referred to the back. As a rule attacks of pain were severe and commonly required hypodermic medication. They generally persisted for more than ten hours and frequently were followed with residual soreness. Often a transient or persisting mass was noted in the upper part of the abdomen, especially in the midline, or left upper quadrant of the abdomen. Jaundice may or may not be present. Studies of the blood may reveal elevation of values for amylase, lipase or sugar. Roentgenologically, a mass of soft tissue may be noted in the upper part of the abdomen and pancreatic or biliary calculi may be visualized. Some roentgenologic abnormalities of the stomach or duodenum may be caused by pressure of the cyst. In brief, a history suggestive of recurrent pancreatitis associated with the finding of a rounded mass in the upper part of the abdomen actually should permit a presumptive diagnosis of pancreatic cyst.

Pathologic Characteristics. As mentioned previously a pseudocyst of the pancreas is not a true cyst in that it does not have an epithelial lining. Generally it is adjacent to rather than within the pancreas and consists of a collection of fluid within a wall composed of fibrous tissue which may vary in thickness from one to several millimeters. Commonly inflammation of the pancreas and less frequently trauma to the pancreas and adjacent structures are the etiologic factors. Its anatomic relationship with the pancreas is variable as such a cyst may be found in association with any portion of the pancreas.

The size of a pseudocyst may vary from several centimeters in diameter to 30 or more and is commonly described as the size of an orange or a grapefruit. It is not rare for it to contain as much as 2 or 3 L. of fluid although smaller cysts are more common. Most frequently it presents the appearance of a rounded, somewhat edematous or indurated cystic mass. The wall usually is thick enough so that the nature of the contents is not discernible on inspection of the cyst. It will be found adherent to all surrounding structures and at times appears to be inflamed. Only in the exceptional case is a truly multilocular cyst found although occasionally the interior of such a cyst may present a somewhat "honeycomb" appearance. Fluid which these cysts contain may be thin or thick; generally it is turbid but it may be clear. Commonly it is a brownish or chocolate color, indicative of the presence of old blood, but at times it is frankly bloody in character. Milky fluid has also been found in these cysts. Bile-stained fluid may occur and rarely purulent material is encountered although the presence of frankly purulent material would indicate the presence of an abscess rather than a cyst. A positive culture was obtained in only one of seven cases in which bacteriologic studies were made of the content of the cyst.

SURGICAL ASPECTS

The surgical approach to a suspected cyst of the pancreas or an indeterminate type of mass in the upper part of the abdomen depends largely on the size and location of the mass. Although a right or left rectus incision may serve adequately for a lesion situated on either side of the midline, a transverse incision placed over the pancreas affords the best exposure of the entire gland. After the abdominal wall has been incised, further exposure of a pancreatic cyst may be obtained through several different approaches, again depending on the size and location of the cyst. Most commonly such a cyst is explored through an opening in the gastrohepatic or gastrocolic omentum. If the cyst is located in some unusual position such as the tail or head of the gland or if it presents retroperitoneally below the transverse colon, some other approach is necessary.

Various procedures have been employed in the surgical treatment of pancreatic cyst depending on the extent and location of the lesion and the concurrent existence of pathologic conditions elsewhere in the abdomen, notably the biliary tract. As for the cyst itself, incision and drainage with or without marsupialization have been used most often. Total excision is seldom feasible because of the pathologic characteristics of these cysts. In certain cases, however, when the cyst is rela-

tively small, complete excision may be accomplished. If the cyst is not removed, it is necessary to provide drainage for a time to permit gradual collapse and obliteration of the cavity. This may require only several weeks or as long as 3 or 4 months or longer. Because of this fact

TABLE 1
TREATMENT IN FORTY-FOUR CASES OF PSEUDOCYST OF THE PANCREAS

Treatment	Cases
Incision and drainage	19*
Incision and marsupialization	12†
Complete excision of cyst	5
Excision of cyst and partial pancreatectomy	3
Partial removal of cyst	1
No surgical treatment of cyst	4

* External biliary drainage performed in 9 cases. Internal biliary drainage performed in 3 cases.
† External biliary drainage performed in 2 cases.

marsupialization is more certain to provide adequate drainage than is mere incision and drainage, particularly if the cyst is a large one. Although by definition a pseudocyst has no direct connection with the ductal system of the pancreas, occasionally after operation drainage contains a considerable amount of external pancreatic secretion. Under these circumstances prolonged drainage or possibly some subsequent surgical procedure may be required before final healing occurs. Surgical treatment carried out in our series of forty-four cases is shown in Table 1.

Incision and drainage were performed most frequently and incision and marsupialization were performed in the next largest group of cases. Drainage of the cyst with or without marsupialization obviously is the simplest treatment and will ordinarily effect satisfactory results provided adequate drainage is maintained for a sufficient time.

If drainage without marsupialization is employed, a large catheter or "dressed" tube preferably size 30 F. or more should be kept in the cavity of the cyst until the latter is completely obliterated. Ordinarily this may be accomplished by shortening the tube for weeks, if necessary, as the cavity fills in around the tube. If a question arises as to how rapidly the tube should be shortened, radiopaque material may be injected through the tube and a roentgenogram will indicate the size of the remaining cavity. While the tube is in place, it often is helpful if it is irrigated every day or so with saline solution, some antibiotic or an antiseptic solution. This not only helps to prevent obstruction of the tube from inspissated material but also aids in reducing the infection that frequently develops. Whether or not it is necessary to connect the tube with a receptacle such as a rubber bag or bottle will depend on the amount of material that drains from the tube each day. Obviously if the tube is removed too soon, the drainage tract may become closed and the cyst may recur. This happened in one case. The patient was operated upon originally in 1935. At this time a cyst 25 cm. in diameter was found and drained with a 30 F. catheter. The tube was removed within one month after operation. The cyst re-formed and a second operation was required in 1937. At this time the cyst was found to contain 700 cc. of fluid. It was marsupialized and prolonged drainage was maintained. The patient has had no further trouble.

If the cyst is of considerable size, often it can be marsupialized without difficulty. Marsupialization is more likely to provide adequate drainage for a sufficient time than is the use of a catheter or soft rubber tissue drain. This is especially true if the cyst is a large one. In fact incision and marsupialization probably should be considered the treatment of choice for most pseudocysts which are of a size and in a position to permit this procedure. (Fig. 3.) This treatment was employed in twelve of the forty-four cases.

If a communication exists between some portion of the ductal system of the pancreas and the cystic cavity through which the external pancreatic secretion is excreted, profuse drainage may persist for months or even indefinitely. Generally this becomes apparent a week or so after operation when the drainage is seen to become less turbid and rather profuse. Depending on what proportion of the external pancreatic secretion enters the cystic cavity, the amount of drainage will vary from several hundred cubic centimeters to 600 or 800 cc. daily. In some cases this drainage will gradually diminish within months and then cease entirely as the communication between the cyst and pancreatic ducts becomes obliterated. In other cases this communication may not become obliterated and copious clear drainage persists. If an adequate fistula lined with epithelium develops, this may be transplanted into the stomach or into a convenient portion of the upper part of the small intestine. In other cases excision of the fistulous tract and possibly

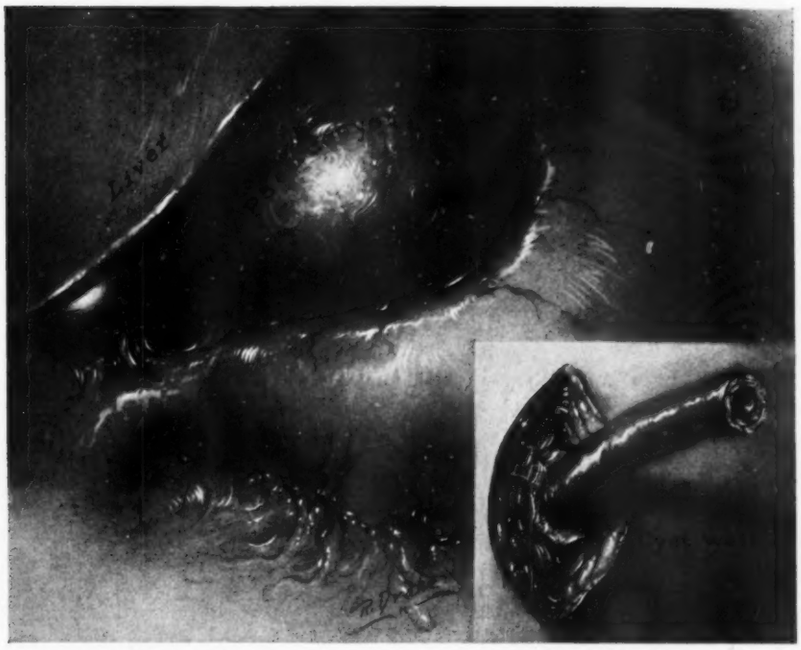


FIG. 3. Pseudocyst is seen at operation and treated with incision, drainage and marsupialization.

removal of the cyst may be required. Simple excision of the fistulous tract and suture of the adjacent pancreas may not correct the condition satisfactorily.

Complete or partial excision of the cyst was employed in six cases in our series. Complete excision may be accomplished without undue hazard if the cyst is relatively small, and was performed in five of these six cases. Partial excision of the cyst probably is seldom indicated except in the course of some form of operation performed to establish drainage. In three cases the cyst and a portion of the pancreas were removed. If the cyst is situated in the tail of the pancreas, this procedure occasionally might be justifiable; however, if the cyst is located in the head of the gland, it would seldom if ever appear warranted to perform an operation as extensive as a Whipple type of procedure. The relatively high mortality rate associated with this operation and the satisfactory result which may reasonably be expected by less radical treatment are the main reasons for not removing the head of the pancreas for a condition of this type. In our series of cases the head of the pancreas of two patients and the tail of the gland of one were removed.

One patient had a recurrence after partial excision of the cyst and internal drainage of the cyst was established five years later by making an anastomosis between the cyst and the duodenum. In four cases nothing was done to the pancreatic cyst itself. In all of these cases there were other findings within the abdomen which seemed to be of paramount importance, and in all but one case the cysts were of small size.

Frequently other pathologic conditions are found within the abdomen in association with a pseudocyst of the pancreas. These occur most often in the pancreas or biliary tract. Twenty-one of the forty-four patients of our group had evidence of pancreatitis. Changes were most often of a chronic nature but in two cases a pancreatic type of fat necrosis was present which is evidence of the more acute type of process. In fourteen cases the common bile duct was enlarged but in only three cases was a stone found in the common duct. Obviously pressure on the lower end of the duct from an enlarged indurated pancreas or the cyst itself may cause some dilatation of the duct in the absence of choledocholithiasis. In nine cases cholecystitis with stones existed, an incidence entirely too high to be coincidental. Cirrhosis was noted in one case.

Nineteen of the forty-four patients had some surgical procedure or procedures performed on the biliary tract at the same time that the pancreatic cyst was discovered. The surgical

procedures performed on these nineteen patients included exploration and drainage of the common bile duct in ten cases, cholecystectomy in nine and cholecystostomy in four. Some patients underwent more than one of these procedures. Nine additional patients had various other procedures performed also. These included resection of the pancreas in three cases, choledochoduodenostomy in two and operation for duodenal ulcer in three.

Mortality Rate. There were four deaths after operation in the group of forty-four patients. Two of these occurred after a Whipple type of operation in which the head of the pancreas was removed. As mentioned previously this is not a recommended procedure for pseudocyst of the pancreas which is recognized as such at the time of operation. Another patient, operated upon in 1937, died the day of operation after incision and drainage of the cyst from an exsanguinating hemorrhage in the vicinity of the cyst. The fourth patient, operated upon in 1936, died on the third postoperative day; the clinical diagnosis was pulmonary edema after cholecystectomy and complete excision of the cyst. It would appear at the present time that simple drainage or marsupialization of a pseudocyst of the pancreas should entail a low surgical risk.

Results. Obviously pathologic changes in the biliary tract, the type and amount of pancreatitis present and other associated lesions may affect the ultimate result after surgical treatment of pseudocyst of the pancreas. This fact makes evaluation of surgical treatment of the cyst *per se* somewhat difficult; however, certain general observations seem worthy of note.

If multiple cysts were present at the time of operation, which was the exception rather than the rule, the patient was definitely more apt to have a recurrence than if only a single cyst was found. This might have been due to the fact that new cysts developed after the initial operation rather than that surgical treatment was inadequate or improper. Likewise patients who had recurring acute or subacute pancreatitis in association with a cyst experienced recurrence of abdominal pain more frequently than those who had only a mild degree of chronic pancreatitis or no abnormal changes in the pancreas at the time of operation.

Patients who had disease in the biliary tract which was treated surgically at the same time the cyst was treated had just as satisfactory results as far as recurrence of the cyst was concerned as those who did not have disease in the biliary tract at the time of initial operation. In fact they were less apt to require subsequent operation on the biliary tract than those patients who did not have surgical treatment for disease of the biliary tract when treatment was instituted for the cyst.

Consideration of all cases[19] in which incision and simple drainage were performed showed that the average period of drainage of a cyst was two and a half months. Follow-up information for seventeen of the nineteen patients covered from five months to twelve years with an average of slightly more than three and a half years. Of this group, two patients died one year after operation of unknown causes and a third patient died six years after operation from extensive pancreatic atrophy, cirrhosis and malnutrition. Two patients required subsequent surgical treatment because of disease in the biliary tract. To our knowledge only two of the seventeen patients had recurrence of the pancreatic cyst. It should be mentioned that for the most part cysts treated with incision and drainage without marsupialization were definitely smaller than those in which marsupialization had been employed. In general those treated with incision and drainage were more the size of an orange or smaller, whereas those treated with marsupialization were more the size of a grapefruit. Obviously more prolonged drainage would seem necessary for the larger cysts than for the smaller ones.

Incision and marsupialization were employed in twelve cases and follow-up information was obtained in eleven of these. The average period of follow-up was 6.7 years, the shortest being fourteen months and the longest fourteen years. The average duration of postoperative drainage was 3.3 months. One patient died nine years after operation of cerebral thrombosis. In two cases subsequent operation on the biliary tract was necessary. Only one patient had a recurrent cyst and it occurred two years after the initial operation. Although it might appear that this rate of recurrence is comparable to that obtained after incision and simple drainage of the cyst, it should be remembered, as mentioned previously, that the average size of the cyst was considerably larger in the group in which marsupialization

was employed than in the group in which simple drainage was instituted.

In the remaining thirteen cases various surgical procedures were used. Of the five patients who underwent complete excision of the cyst, one died of pulmonary edema soon after operation and the remaining four had no further symptoms after operation and were well two to thirteen years later. The average period of follow-up study in these cases was 6.2 years. All three patients who underwent excision of the cyst and partial pancreatectomy died; the two who had had the head of the pancreas removed died early in the postoperative period as already mentioned and the one who had had the tail of the pancreas excised died suddenly of an unknown cause one and a half years after operation. The patient who underwent partial removal of the cyst later had a recurrent cyst which required further surgical treatment. This patient died after subsequent operation performed ten years after the initial operation from persistent and recurring disease in the pancreas associated with cystic formation. In four cases nothing was done to the cyst itself but other surgical procedures were performed in all but one. Three of these patients are known to have lived for intervals varying from six months to two years after operation; one patient died three years later. Significant observations on their postoperative condition are difficult to make because of associated pathologic conditions.

COMMENT

Probably the greatest controversy regarding pseudocyst of the pancreas concerns the choice of surgical treatment. Some authors have stated that complete excision is the treatment of choice when possible although there are few cases in the literature to substantiate this opinion. Actually pseudocyst of the pancreas, unless unusually small, does not lend itself well to total excision as it does not have the wall of a true cyst, is adherent to all surrounding structures and may require quite an extensive and hazardous operation for its total extirpation. It seems certain that if complete removal were attempted in all cases, the operative mortality would be excessive. Seldom if ever does it appear justified to perform partial resection of the pancreas in order to remove a pseudocyst, especially if the cyst is located in the head of the gland.

Internal drainage by anastomosis of the cyst to the stomach, gallbladder or jejunum has been reported.[24] Jedlicka (1923) is credited as being the first to perform internal drainage of a pancreatic cyst. For the most part no author has reported more than two or three cases in which internal drainage was used, so experience with late results after this type of treatment is limited. Some who have employed internal drainage consider it to be the treatment of choice but we believe that more experience should be obtained with this method before other more widely employed procedures are abandoned. Although our experience with this operation is limited, several possibly undesirable aspects of internal drainage of a pseudocyst of the pancreas are at once apparent: (1) Unless a defunctionalized loop of intestine is used for the anastomosis there might be regurgitation and stasis of intestinal content in the cystic cavity. (2) As the cyst shrinks in size as a result of drainage, the stoma of the anastomosis might become inadequate for satisfactory drainage. (3) Internal drainage is a more extensive surgical procedure than external drainage and might carry a greater initial risk and more chance of untoward postoperative sequelae. It would seem that drainage of the cyst into the intestine is definitely preferable to drainage into the gallbladder if internal drainage is performed.

In most cases and for most surgeons external drainage of adequate duration, preferably by marsupialization if the cyst is large, appears to be the treatment of choice. Although recurrence may take place if drainage is maintained for too short a time, this can be prevented in almost every case by careful postoperative care. The chance of serious infection developing in the cyst and adjacent structures during drainage is minimal with irrigation of the cyst and the antibiotics which are available today. Probably the main objection to this type of treatment is the prolonged care necessary while the cystic cavity is gradually being obliterated. Serious excoriation and digestion of the skin surrounding the site of drainage do not occur after drainage of a pseudocyst even though the material which drains is composed solely of pancreatic juice since the latter is inactive before it enters the duodenum. Attempted obliteration of a pseudocyst by injection of a sclerosive or necrotizing agent is not recommended.

SUMMARY

Pseudocyst is the most common cystic lesion which occurs in association with the pancreas. Pancreatitis appears to be the most frequent etiologic factor in the development of a pseudocyst. Characteristically, a patient who has a cyst of this type presents a history suggestive of recurring pancreatitis and a rounded mass somewhere in the upper part of the abdomen. The mass may change in size or at times disappear entirely between attacks of abdominal pain. Occasionally pain is absent or minimal. Roentgenologic studies may show abnormalities in the stomach or duodenum caused by pressure from the cyst.

Forty-four cases of pseudocyst of the pancreas are reviewed. The procedure of incision and drainage with or without marsupialization is considered the treatment of choice. Cysts recurred in only three of the thirty-one cases in which treatment of this type was employed. In each of these three cases it appeared that an inadequate period of drainage had been maintained. Total excision of the cyst or an anastomosis between the cyst and some part of the intestinal tract are recommended only in exceptional cases.

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KÜMMELL'S DISEASE*

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BEFORE the advent of the x-ray Hermann Kümmell in Halle in 1891 described a clinical entity manifested by trivial trauma to the spine followed by a short, indefinite, asymptomatic period culminating in a symptomatic, progressive, angular kyphosis. He presented four cases and later described the symptom complex which now bears his name.

For a period of thirty-five years following his initial dissertation he defended his original precepts through numerous vicissitudes which he described in 1921[1] as "annihilating." Kümmell's disease is still struggling for acceptance. This paper presents illustrative cases and describes the disease which may best be defined as delayed, post-traumatic collapse of a vertebra.

The condition was initially described by Schede[2] in 1881. He characterized the disease as slow softening of the body of the vertebra followed with late development of angular kyphosis. Kümmell quoted König[3] as mentioning the clinical condition in a contemporary text, but König apparently regarded the collapse as a manifestation of atypical spinal tuberculous. Verneuil[4] in 1892 in the Paris Medical Academy reported on a case of vertebral fracture with an obscure etiology associated with girdle pain and a delayed gibbous formation considered to be "rheumatism of the abdominal viscera and abdominal muscles." It remained for Professor Kümmell,[5] however, to describe lucidly the symptom complex which he called rarefying osteitis of the vertebra.

His pupil, Schulz,[6] in 1911 presented a noteworthy description of twenty-one cases and gave us the eponym Kümmellsche Krankheit.

Since that time the literature has been replete with case reports.[7–21] The last decade has shown a decline in reported cases although it is generally conceded that Kümmell's disease (or post-traumatic spondylitis) is a definite symptom complex. Perhaps the decline is occasioned by better roentgenograms, particularly in lateral spine projections. Thus more frequent diagnoses of minimal fractures are made which might have gone on to late collapse and misdiagnosis as Kümmell's disease.

Also, expansion of knowledge has taught us that a true compression fracture, especially in the lower segments, may be present with minimal clinical findings. These cases untreated might go on to symptomatic back and be diagnosed as Kümmell's disease after x-rays show collapse. It is thus not at all improbable that many cases of fractured vertebrae with delayed symptoms were reported as Kümmell's disease.

Rigler[22] says, "If good roentgenograms, made at the time of injury or shortly thereafter, showed no evidence of fracture or other abnormality and later routine examination revealed a compression of one or more of the vertebrae, the diagnosis of Kümmell's disease would appear to be fairly well established." He criticizes this criterion, however, on the grounds that a fracture may be present and not seen but points out that a compression following this type of injury would be different enough from ordinary vertebral fractures to justify placing it in a separate group.

Kümmell's last report on the condition was in 1928.[23]

Etiology. The etiology of Kümmell's disease is always trauma, usually inconsequential and often considered of little significance. On occasion the trauma is severe with no x-ray evidence of vertebral collapse in the immediate postinjury period. Kümmell originally characterized the trauma as slight and not such as would ordinarily result in the fracture of a vertebra. A blow on the back, the impaction of a heavy body on the spinal column or spine flexion injury with resulting pressure on one of the vertebral bodies may result in the typical pathologic condition.

Incidence. In Kümmell's original paper the lesions were reported as occurring most commonly from the third to the eighth thoracic

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vertebra. Most authors state that the twelfth thoracic and the second and third lumbar vertebrae are the most frequently involved. The condition is rare in young people. There is a slight difference in age incidence above twenty-one. Most patients are males.

Clinical Picture. The course of Kümmell's disease can be conveniently divided into five stages, namely, the initial insult, post-traumatic period, latent interval or, state of relative well-being, recrudescent stage and terminal stage.

In the initial insult severity and type of trauma vary. The injury is usually hyperflexion of the spine. The vertebral column is normal by x-ray.

In the post-traumatic period the patient may complain of minor back pain but usually complaints center on coincidentally injured areas. He has no post-traumatic sequelae whatsoever and is able to work.

The latent interval or stage of relative well-being following the post-traumatic period and preceding the onset of progressive disability usually lasts weeks or months during which time the patient is not incapacitated.

In the recrudescent stage the patient complains of pain in the back. The symptomatology is at first well localized with tenderness, pain and a feeling of insecurity at the site of the pathologic condition. A gibbous may be evident as loss of stature progresses. The symptoms tend to become more peripheral with root pain.

The terminal stage is characterized by the formation of a permanent kyphus or may be made manifest by progressive pressure on roots or spinal cord.

Laboratory and X-ray Findings. The laboratory findings are usually normal with no changes in calcium, phosphorus or phosphatase blood levels. The x-ray reveals no pathologic disorder in any projection at the time of initial insult. At the time of recurrence of symptoms the x-ray study reveals a partially collapsed vertebra. There is a definite settling process and a decrease in height of the vertebral body. The decrease in bone volume is more noticed anteriorly than posteriorly, but occasionally it may be manifested by a general decrease in vertebral body height and uniform settling.

In an occasional case with lumbar involvement alone there may be only flattening of the lordotic curve. When the thoracic vertebrae are involved, the only noteworthy finding in an x-ray film may be a prominence of the spinous process. The lateral roentgenogram will demonstrate the change of the anatomic structure of the vertebral body from a parallelogram of regular proportions to a deformed body in the shape of a truncated cone. As pointed out by Blaine,[24] if lateral projections are not a routine procedure, the lesion will be missed.

Patbologic Considerations. It has become the general opinion that the essential pathologic disorder consists of multiple, minute traumas to the osseous and ligamentous structures of the spine causing cracks and small hemorrhages. The minute ruptures in the spongiosa are followed with bone necrosis. The collapse of the vertebral body and the wedge-shaped deformity which follows are sequelae to too early strain on deficient material. These pathologic findings are also seen in unrecognized fractures of the femoral neck and carpal scaphoid.

Cardis, Walker and Olver[25] succeeded in making a postmortem study of a case which they regarded as Kümmell's disease. It evidenced small focal hemorrhages in the spongiosa, atrophy of the bony framework, deterioration of the bone marrow and beginning assumption of the wedge shape by the affected body.

Differential Diagnosis. It is particularly important from a medical-legal viewpoint and in addition from the viewpoint of a patient's future functional capacity that an early diagnosis be made correctly. The diagnosis of Kümmell's disease should always be considered where there has been history of minor trauma to the back or where symptoms are ameliorated only to recur. Radiography is of paramount importance.

In differential diagnosis the following lesions must be ruled out: simple contusions, traumatic myositis, herniated disc, osteoporosis, ankylosing spondylitis, hypertrophic arthritis, primary or metastatic neoplasm, spondylitis, Pott's disease and neurosis.

With the possible exception of neurosis, tuberculous spinal caries present the most difficult differential. It should be remembered that in Kümmell's disease the patient is in all other respects a normal, healthy person. Only one vertebra is involved, no fever is present, no abscess is noted and there is no

sinus formation. The x-ray reveals a wedge-shaped vertebra with clear edges and intact discs. In tuberculous spondylitis the absorption of bone tissue is much more evident and the condition is vastly more painful. The gibbous formation is invariably more pronounced and children are most commonly affected. In rheumatoid arthritis there is a universal settling of all the bodies with a marked decrease in height more prominent in the anterior surface. Also, it is not confined to one bone as in Kümmell's disease. Primary or metastatic neoplasm shows local decrease of the bone density but the general outline of the osseous structure tends to remain until completely collapsed by excess stress and strain. Syphilis of the bone is manifested by an increase of osseous material and periosteal overgrowth. Charcot spine shows marked disintegration usually of more than one vertebra with an intermixture of pathologic and normal material. Osteoporosis is not confined to one bone of the spine but is a diffuse change.

Treatment. A striking feature of Kümmell's disease is the relatively mild degree of disability resulting in the great majority of cases. Blaine[14] states that if true disability were to occur he would question the validity of the diagnosis of Kümmell's disease. The condition is usually treated symptomatically, with good results on immobilization in a plaster jacket for three months followed with application of a back brace. Fusion is rarely indicated unless there are signs of cord compression. The most important precept governing treatment is to secure rest for the spine and relieve pressure on the crushed body.

Prognosis. Steindler[26] states that the prognosis in "Kümmell's kyphosis," as he terms it, is usually good and that permanent disability is rare with a partial disability of 10 to 15 per cent being most frequent. This has been the experience of most observers. The extent of deformity depends upon the early recognition of the condition and the institution of adequate immobilization.

CASE REPORTS

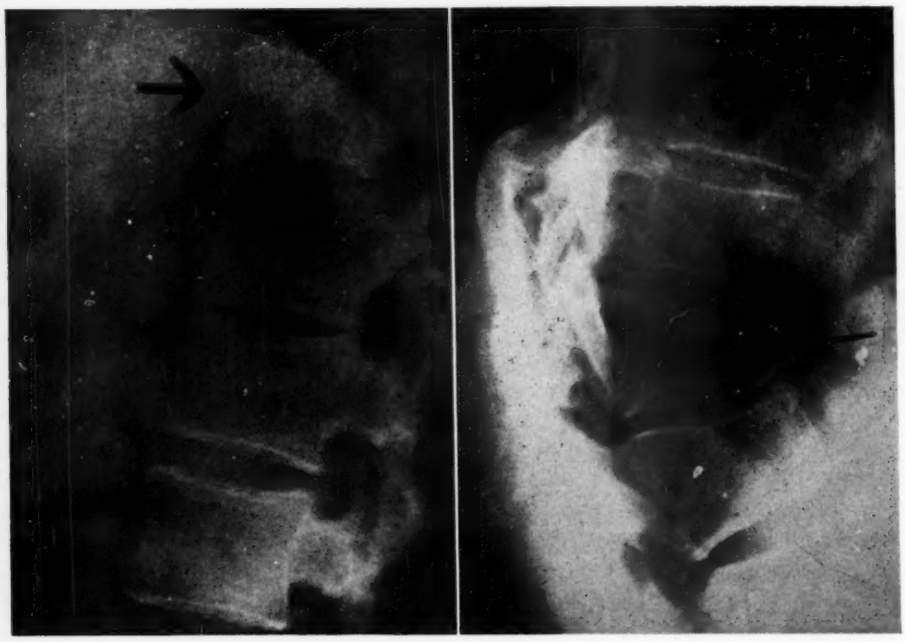
The following cases were observed in the Veterans Administration Hospital, Lake City, Florida:

CASE 1. B. C., a twenty-three year old male, was admitted to the hospital with the chief complaints of stiffness, girdle-pain and feeling of weakness in the lumbar spine.

The patient was in his usual state of health until six months before admission at which time he was forced to bail out of an airplane. Before opening his parachute he was struck across the heels by the tail assembly and was doubled up rather forcefully. He made a safe landing. His only complaint was a numb feeling in both heels and pain in the region of his mid-back. He was able to walk with no difficulty and was taken to a nearby hospital where x-ray examinations were made of his heels and back. Neither revealed any evidence of fracture. His back was strapped and he was discharged from the hospital. After one week the patient stated that his heels and back were normal and he returned to his occupation of shrimp fisherman.

The patient fished strenuously for two months with no symptoms referable to the back. He then noticed a prominence, progressively more evident in the region of his previous back pain. Seven days before admission the patient complained of a dull ache in the back with pains radiating around both left and right sides to the groin. He stated that the pain was relieved when he bent backward and lay with a pillow in the small of his back. The symptoms progressed until at the time of admission the pain was incessant.

The patient's previous medical history was non-contributory. Physical examination revealed a robust twenty-three year old white male veteran of World War II appearing older than his stated age. His posture was definitely stooped and a tender gibbous was palpable at D10. The paravertebral muscles were in spasm. All the leg signs were positive. There was no atrophy in either extremity, no muscle weakness and no sensory disturbance. There was some diminution of the left knee jerk but no pathologic reflexes. The patient's calcium, phosphorus and phosphatase were within normal limits. The serology was negative and the chest x-ray normal. The x-ray of the lumbar spine taken in this hospital revealed marked wedge shaping of the tenth dorsal vertebra. (Fig. 1B.) His old x-rays (Fig. 1A) were made available through the cooperation of the hospital where he was first examined. These films when carefully scrutinized revealed no suggestion of a fracture of the tenth dorsal vertebra.



1A 1B

FIG. 1. Case I. A, lateral view of tenth thoracic vertebra after initial trauma; B, lateral view of tenth thoracic vertebra six months after trauma showing formation of angular kyphosis.

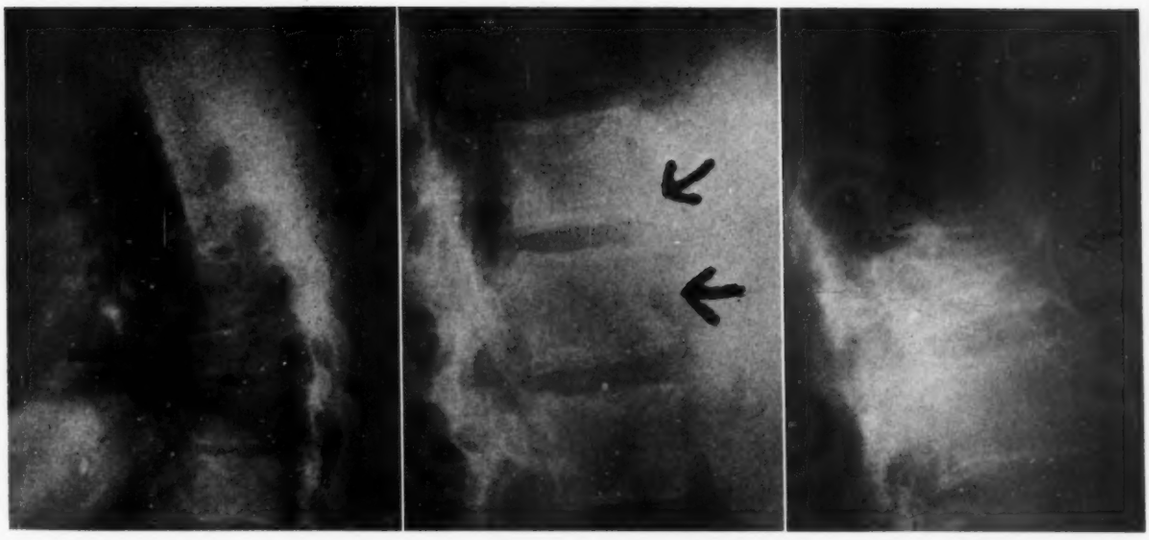
The patient was immobilized in a hyperextension plaster cast for three months after which he wore a Taylor back brace. When last seen he was asymptomatic and had returned to his work.

CASE II. A. J., a twenty-eight year old colored male, was admitted to the hospital with a history of having fallen from a twenty-foot scaffold. He had suffered a typical compression injury in hyperflexion. He stated that the moment after injury he felt as if paralyzed but by the time help arrived he was able to move his legs normally. X-ray of his back revealed a fracture of the eighth dorsal vertebra. (Fig. 2A.) He was likewise complaining of pain in his lumbar region. An anteroposterior and lateral view of this area revealed no pathologic condition. (Fig. 2B.) The patient was immobilized in a hyperextension body jacket. At the end of three weeks of immobilization he insisted on a pass from the hospital to take care of an emergency at home. He failed to return and was discharged.

Fourteen months later the patient was readmitted to the hospital with a complaint of severe sharp pain in the left lumbar region with radiation into the left scrotum. He stated that the pain had started one month previously as a nagging ache in the back with no antecedent trauma. This had gradually progressed until the patient sought admission to the hospital. There were no genitourinary complaints but the history, suggesting a kidney stone, led to roentgenologic examination of the abdomen. The anteroposterior view suggested a compression fracture at the first lumbar vertebra and the lateral view confirmed this suspicion. (Fig. 2C.) Changes at the joint surface and inferior border of the twelfth thoracic vertebra are likewise evident.

The patient was then questioned about the previous injury to his back and the after-care. The patient revealed that one week after leaving the hospital he had fallen in a river while fishing and in addition to saturating his body jacket had very nearly drowned. His cast was removed by his rescuers to facilitate artificial respiration. The patient never bothered having it reapplied. He stated that in the intervening twelve months he had done very little work, had suffered no injury and had had no pain in the back until one month before admission.

A thorough study of the patient's gastrointestinal and genitourinary systems revealed no pathologic condition. The serology was



2A 2B 2C

FIG. 2. Case II. A, lateral view of dorsal spine with fracture of eighth thoracic vertebra; B, lateral view of lumbar spine at time of initial trauma and fracture shown in 2A; C, lateral view of lumbar spine fourteen months after trauma showing collapse of body of first lumbar vertebra.

negative although the patient stated that he was treated for "bad blood" while in the army with the usual antileutic penicillin routine.

X-ray of the patient's dorsal spine revealed an increased deformity, marked osteoarthritic changes and partial fusion at the site of the fifteen month old fracture.

Physical examination revealed a fairly well developed, well nourished, poorly cerebrating colored male veteran of World War II appearing his stated age. There was a kyphus formation in the dorsal spine and a tender abnormal prominence in the region of the first lumbar vertebra.

Forward flexion of the spine was limited to five degrees. Hyperextension was not possible without exquisite pain in the lumbar spine. The straight leg–raising sign was positive bilaterally. There was no atrophy and no sensory disturbance. All reflexes were equal and active and no pathologic reflexes were elicited. Spinal tap revealed no abnormalities. Spinal fluid Wassermann test was negative.

The patient was immobilized in a hyperextension body jacket and given back and abdominal musculature exercises. After eight weeks the patient was given a Taylor back brace and discharged with no symptoms. A six-month follow-up revealed that the patient was asymptomatic and still wearing a brace.

CASE III. H. R., a sixty-two year old white male veteran of World War I and II, was admitted to the hospital with a chief complaint of shooting pains radiating from the mid-back area into the legs, made worse by sudden exertion.

The patient had been in excellent health all his life with the exception of an operation for perforated gastric ulcer in 1945. Since then he had had no incapacitating difficulties. In 1944 while serving in the U. S. Merchant Marine the patient was struck in the back by a sugar sack. He was dazed but not rendered unconscious. He was confined to his bunk by the ship's doctor. He had considerable pain in the back throughout the Atlantic crossing and on arrival at Casablanca he was examined by an orthopedic surgeon and x-rayed. No pathologic condition was found at that time.

He returned to the United States with his ship, still suffering with some pain in the back, and was studied in the Marine Dispensary in Philadelphia where again x-rays revealed no fracture. He was placed on bed rest and two months postinjury was asymptomatic. Shortly thereafter the patient was discharged from the Merchant Marine and took the job of a plant policeman. Three months before admission he was beset by dull nagging pain in the low back region which was made worse by walking. There had been no abatement of pain in the back, and pain in both lower extremities was accentuated.

Physical examination on admission revealed

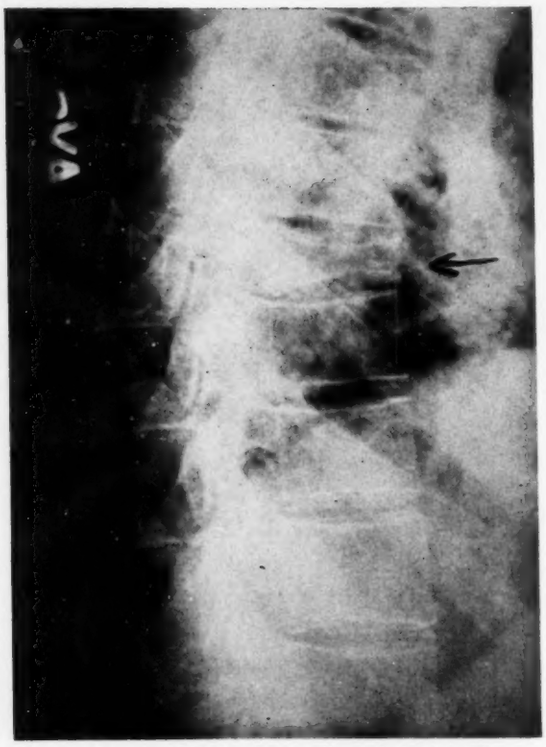


FIG. 3. Case III. Wedge formation of eighth thoracic vertebra considered to be post-traumatic spondylitis.

a sixty-two year old male appearing his stated age. He had mild dorsal kyphosis. His general physical examination presented no abnormalities. The most prominent area of the kyphosis was markedly tender.

The leg signs were positive and motion of the back was markedly limited in all planes. There were no sensory or motor disturbances in the extremities and the reflexes were normal. Serology, urinalysis, blood count, phosphorus, calcium, phosphatase and protein were normal.

X-ray examination revealed a marked wedge-shaped deformity of the eighth dorsal vertebra. (Fig. 3.) The patient's x-rays taken in Casablanca were inaccessible. The patient's medical record stated, however, that x-rays revealed no fracture in the anteroposterior and lateral views of dorsal and lumbar spine. The x-rays taken in Philadelphia also could not be reviewed personally but the report on them was cited as showing no pathologic disorder of the bone. The patient was placed in a hyperextension cast and after three months immobilization was supplied with a Taylor back brace. The patient was discharged with no symptoms. He was last seen twelve months before this writing wearing his brace with no symptoms and working. He was killed shortly thereafter in an automobile accident.

CONCLUSIONS

1. The diagnosis of Kümmell's disease is not justified without negative lateral roentgenograms taken in the early postinjury period, with later films showing positive findings of collapse. The amount of disability following spinal injury should not dictate the need of x-ray examination. Spinal injury, no matter how trivial, should be followed with roentgenologic study, and reexamination if symptoms recur is definitely indicated.

2. The sequence of injury, latent period and recurrence of symptoms seem fairly well established as the clinical picture of Kümmell's disease.

3. The disease, or better still symptom complex, may occur at any age. It is rarely seen in young people, however.

4. The differential diagnosis must include tuberculosis of the spine, herniated nucleus pulposus, lumbar back strain, anklosing spondylitis, primary or metastatic neoplasm, syphilitic spondylitis, hypertrophic arthritis and neurosis.

5. The prognosis is good but depends on early diagnosis and institution of proper orthopedic measures.

6. The treatment is directed toward stabilization of the affected vertebrae.

7. Kümmell's disease or post-traumatic spondylitis is best described as delayed post-traumatic collapse of the vertebra with the essential pathology consisting of multiple, minute traumas of the osseous and ligamentous structures of the spine causing small interruptions in bony continuity and blood supply.

SUMMARY

Kümmell's disease or symptom complex and the literature extant on it have been reviewed. Three cases seeming to answer the necessary criterion for the diagnosis have been presented.

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USE OF PROPHYLACTIC PENICILLIN IN OBSTETRICS*

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THE discovery of the specific bacteriostatic action of penicillin placed a powerful therapeutic agent in the hands of the medical profession. Of particular interest to the obstetrician is the ability of this agent to inhibit the growth of certain strains of aerobic and anaerobic bacteria which cause the majority of puerperal infections.

In the past twenty years the incidence of puerperal mortality due to sepsis has been reduced from 1.0 to 0.47 per 1,000 live births. Accompanying this lowered death rate there was a similar decrease in morbidity. The decreased incidence of puerperal infection and the lessening of its severity when it did occur are due to many recent obstetric advances, namely, intelligent prenatal care, maintenance of electrolyte and fluid balance during labor, local or saddle-block anesthesia for delivery, atraumatic and aseptic delivery technic, adequate whole blood replacement, early ambulation and the use of the sulfonamides and antibiotics whenever indicated. The progress made has been notable but puerperal morbidity still exists and women who undergo an apparently normal prenatal and intrapartum course still die from puerperal sepsis.

For several years we have administered penicillin prophylactically to all obstetric patients with premature rupture of the membranes, prolonged labor, intrapartum infection and difficult operative delivery, and to those in whom the uterus was invaded manually. It was found that the anticipated morbidity rate was more than halved by such a procedure; the reports published from other obstetric services have corroborated these findings.

Penicillin proved to be so effective in decreasing the incidence of puerperal infection in potentially infected patients that the question naturally arose as to whether or not the administration of penicillin prophylactically to the apparently normal obstetric patient during labor might further decrease the incidence of puerperal morbidity. Pierce placed a cocoa-butter suppository containing 200,000 units of penicillin in the upper vagina immediately following delivery and reported that the incidence of morbidity was reduced by 50 per cent. Abel has reported that the degree of absorption employing this mode of administration is not uniform and apparently results in a significant percentage of allergic manifestations. Tuppen and Keettel both administered varying amounts of penicillin intramuscularly during labor and reported a marked decrease in the incidence of puerperal morbidity. Guilbeau, Schaub and Andrews reported a small series in which they demonstrated that no pathogenic bacteria could be cultured from the uterine cavity of 74 per cent of their parturient patients to whom they had given a single injection of from 200,000 to 400,000 units of penicillin during labor. The authors concluded that an adequate amount of penicillin so administered would eliminate pathogenic organisms from the uterus for three or more days postpartum.

Encouraged by our good results from the prophylactic use of penicillin in those patients in whom puerperal infection might be expected to occur we decided to conduct a study to determine whether or not the routine administration of penicillin to all patients early in the course of labor was an indicated procedure. From March 8, 1949, to September 11, 1949, there were 1,156 vaginal deliveries in the obstetric department of the United States Naval Hospital, Portsmouth, Virginia. The

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majority of these patients were delivered by interns and residents under the supervision of the senior staff members. In twenty-five patients obvious prepartum or early intrapartum infection was present; they were treated therapeutically with penicillin and

TABLE I
PRENATAL COMPLICATIONS

	Control	Prophylatic Penicillin
Preeclampsia, mild	37	23
Preeclampsia, severe	12	6
Eclampsia	0	2
Essential hypertension	1	0
Cardiac disease	3	1
Chronic nephritis	2	0
Pyelonephritis	2	2
Syphilis	1	3
Tuberculosis, pulmonary	1	1
Placenta previa	2	2
Abruptio placentae	5	6
Polyhydramnios	2	2
Prolapsed cord	2	0
Premature labor	35	29

are not included in this series. The remaining 1,131 cases are the subject of the present study.

At the onset of active progressive labor, i.e., 3 to 4 cm. of cervical dilatation, 300,000 units of procaine penicillin G in sesame oil were administered intramuscularly. No patient in this series received more than the one prophylactic penicillin injection. The alternate case method was employed and the only selection exercised was to place in the control group those patients admitted to the delivery floor in advanced labor. This naturally placed a higher percentage of primiparas in the treated group and multiparas in the control, but the difference was not significant. Six hundred twenty-two patients did not receive penicillin; they constitute the control group. Five hundred nine patients received penicillin prophylactically; they comprise the treated group. One thousand eighty-two of the patients were Caucasian and forty-nine were Negroes. The prenatal complications occurring in both groups are depicted in Table I.

Adequate nutrition, fluid balance and analgesia were maintained during labor. Eighty-five per cent of the patients were delivered under a minimal saddle-block pontocaine anesthesia using the technic described by Dorgan, McGaughey and Litton. The remainder of the patients received local, pudendal block or inhalation anesthesia. No statistically significant difference in the type of anesthesia was noted in the two groups. The unusual features of labor and the various methods of delivery

TABLE II
COMPLICATIONS OF LABOR AND METHODS OF DELIVERY

	Control	Prophylactic Penicillin
Prolonged labor (over 24 hr.)	15	24
Prolonged second stage (over 2 hr.)	23	28
Manual removal of placenta	1	4
Postpartum hemorrhage (over 500 cc.)	5	1
Membranes ruptured over 24 hr	6	9
Low forceps	303	293
Mid-forceps	9	10
Breech delivery	26	19

employed are shown in Table II. There were proportionally more low forceps deliveries performed in the treated group and nearly twice as many manual and forceps rotations.

The management of the puerperium was essentially the same in both groups and followed our departmental routine in which early ambulation is stressed. With the exception of those patients suffering from toxemia or excessive blood loss any parturient who so desires may rise and walk to the bathroom eight hours following delivery. All patients without complications were ambulatory within twenty-four hours.

When clinical indications arose during the puerperium, penicillin and any other necessary therapy was used therapeutically in patients in either group. In order to determine the degree of puerperal infection therapeutic measures were not instituted until a definite diagnosis was made or the patient had attained a definitely morbid state. Morbidity was determined by the usual standard, an elevation of temperature to 100.4°F. or above for two consecutive days after the first twenty-four hours. As previously reported from this service we classify as febrile all patients who sustain an elevation of temperature to 99.4°F. or above for any two successive days of the

puerperium after the first twenty-four hours but who do not attain sufficient elevation to be classed as morbid. Among those patients who did not receive a prophylactic injection of penicillin the morbidity rate was 4.19 per cent and the febrility rate 10.6 per cent. In the penicillin-treated group the morbidity rate was 1.37 per cent and the febrility rate 3.1 per cent. Table III shows the causes of the morbid and febrile states.

TABLE III
PUERPERAL MORBIDITY AND FEBRILITY

	Control		Prophylactic Penicillin	
	Morbid	Febrile	Morbid	Febrile
Episiotomy infections	4	14	2	3
Puerperal sepsis	14	22	5	4
Urinary tract infection	2	5	0	2
Puerperal mastitis	3	8	0	3
Thrombophlebitis	0	1	0	0
Upper respiratory infection	1	3	0	0
Unknown	2	13	0	4
Total	26	66	7	16
Total patient days	69	161	16	43
Percentage	4.1	10.6	1.3	3.1

A total of 1,152 infants were delivered in the series, with eleven stillbirths and ten neonatal deaths for a gross fetal mortality of 1.8 per cent. In ten infants fetal death was diagnosed prior to the onset of labor or congenital malformations incompatible with life were present; the corrected fetal death rate was 0.9 per cent. After corrections the control group contained one stillbirth and six neonatal deaths; three of the latter were infants weighing less than 1,500 gm. In the group of mothers receiving penicillin two stillbirths and two neonatal deaths occurred, the latter deaths occurring in a set of premature twins. All infants weighing over 1,000 gm. have been included in these figures. No untoward effect was noted in any living infant delivered of a mother in the treated series and no pre- or intrapartum fetal death was attributed to its use.

There were no systemic reactions to the administration of the penicillin and no abscesses resulted; a few patients did complain of transitory discomfort at the site of the injection. There were no maternal deaths in either group.

COMMENTS

In most cases of puerperal sepsis it is believed that the causative organism enters or is introduced into the genital tract at the time of greatest susceptibility, that is, late in labor, during delivery or in the immediate puerperium. Probably it is the rare case in which the original infection occurs at a later time.

In this study we have attempted to determine (1) whether or not the routine prophylactic administration of penicillin to the apparently uncomplicated obstetric patient early in labor will protect her from puerperal infection and (2) what untoward effects might be anticipated from such a routine.

An affirmative answer seems to be given to the first question by the results obtained. The prophylactic injection of 300,000 units of penicillin G in sesame oil early in labor resulted in a significant decrease in the incidence of puerperal sepsis and a considerable saving in febrile days. Morbidity and febrility were reduced by 70 per cent. In fact the total of the febrile complications (morbid plus febrile cases) in the treated group was only slightly greater than the incidence of morbidity alone in the untreated group. An analysis of the seven cases morbid despite the prophylactic administration of the antibiotic, reveals that in all but one there was some complication of the labor or the delivery. In three the labor was prolonged over twenty-four hours, and in five extensive operative procedures were required to accomplish delivery. Those patients who became morbid or febrile despite the administration of the antibiotic prophylactically may have harbored penicillin-resistant organisms or may have received an insufficient dosage of the antibiotic. The fact that only three of twenty-four patients with prolonged labor became morbid would lead one to believe that a penicillin-resistant organism and not insufficient dosage was responsible. Decreased host resistance due to dehydration, blood loss or electrolyte imbalance may have been an unrecognized factor.

Our second question relative to the possible deleterious effects of a routine injection of penicillin to all women in labor is more difficult

to answer. Systemic reactions to the antibiotic did not occur in this series and the local reactions were minor. This does not prove that the procedure is innocuous. Has any patient in the treated group been sensitized by its administration? Has any bacterial group been made penicillin-resistant? Has any case of syphilis been masked? Will any infant suffer from its intrauterine dose of penicillin? It is hoped that in a subsequent paper these important questions regarding the delayed effects of routine administration of penicillin can be answered.

CONCLUSIONS

1. A single injection of penicillin administered early in normal labor caused a substantial decrease in the incidence of puerperal infections.

2. No systemic or significant local reactions occurred following the intramuscular injection of 300,000 units of procaine penicillin G in sesame oil.

3. Before the routine prophylactic administration of penicillin is universally adopted, the important questions pertaining to the latent sequellae and sensitizing powers must be answered. Sound obstetric judgment, rigid aseptic technic and proficiency in the art of forceps manipulation still remain the first line of defence against puerperal sepsis.

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IMMEDIATE UNTOWARD REACTIONS TO SPINAL ANESTHESIA*

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SUDDEN deaths from spinal anesthesia although infrequent tend to discredit a valuable method of anesthesia. Such catastrophes are difficult to explain and often leave both surgeon and anesthetist at a loss for an explanation for the accidents. Most of the deaths, however, are preventable. It is the purpose of this paper to discuss the abnormal physiologic mechanisms and treatment of these untoward reactions to avert a fatal outcome.

Certain generalizations may be made concerning the use of spinal anesthesia and the commonly encountered reactions. Use of the method in improper cases, inadequate familiarity with the technic, failure to recognize untoward reactions quickly and improper or inadequate treatment of the reactions may lead to permanent damage or death of the patient. In many quarters debilitated, toxic, poor risk patients who are believed unable to survive general anesthesia are considered suitable candidates for spinal anesthesia. The reverse is usually true. Routinizing the method for specific operations is certain to lead to fatalities. The general condition of the patient, not the operation, is the important factor in election of the method. The anesthetist must be entirely familiar with his technic of administration of spinal anesthesia. It is far better for him to master a single technic, whether it is procaine, pontocaine-glucose or procaine-pontocaine, and use it well than to attempt to experiment with several. He must be capable of recognizing the warning signs of untoward reactions and of instituting proper treatment at once. Lack of vigilance for even a few moments may lead to irreversible damage. Proper treatment implies forethought in being prepared for accidents. Equipment for resuscitation, oxygen, suction, analeptics, fluids and plasma should be immediately available and ready for use.

Most physicians are aware of certain dangers inherent in spinal anesthesia but do not realize that there are several mechanisms for the accidents which may happen. The abnormal physiology responsible for cerebral damage or death has not been sufficiently emphasized. The more common reasons for reactions are as follows: (1) uncontrolled height of anesthesia; (2) sudden peripheral circulatory failure with cerebral and medullary hypoxia; (3) intravascular injection; (4) drug sensitivity; (5) action of the anesthetic drug directly on the medullary centers; (6) reactions which may or may not be associated with or be secondary to the method.

UNCONTROLLED HEIGHT OF ANESTHESIA

Most deaths from spinal anesthesia have been ascribed to unexpected cephalad spread of the anesthetic agent. The danger of cephalad spread has been repeatedly brought to mind so that most physicians have become cautious and studiously avoid this accident if possible. Uncontrolled spread of the anesthesia is liable to occur in patients with increased intra-abdominal pressure from obesity, pregnancy, ascites and large abdominal tumors. Such patients should be viewed with caution. Alternate methods such as fractional spinal or endotracheal inhalation methods are often more safely employed for abdominal surgery under such circumstances. Ascending involvement of the thoracic motor fibers innervating the intercostal and finally the phrenic nerve roots in the cervical region causes respiratory failure. Cessation of respiration may be quite sudden, but often the patient if not unduly narcotized by medication gives some warning that the drug has affected the cervical or cranial nerves. Sometimes he will complain that his hands are becoming numb, that he is "numb all over" or that it is becoming difficult to breathe. Examination by pinch or pinprick shows the unexpected extent of analgesia. Cyanosis may be visible because of inadequate

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respiratory exchange. The accessory muscles of respiration may be active and "tracheal tug" seen. The voice may be weak and hoarse, the tongue numb and the speech slurred.

Death follows within a few minutes if proper treatment is not immediately instituted. This consists of the establishment of a free airway, artificial respiration, preferably with an anesthesia apparatus, and administration of oxygen. If the circulation is adequate, it is then merely necessary to wait for the level of motor paralysis to recede and respiration to be resumed. Respiratory stimulants are of no value since the effector nerves are paralyzed.

PERIPHERAL CIRCULATORY FAILURE WITH CEREBRAL AND MEDULLARY HYPOXIA

Peripheral circulatory failure with its resultant cerebral and medullary hypoxia is, I believe, the most common cause of death from spinal anesthesia today. This reaction may occur along with uncontrolled spread of the anesthetic; and although it is more common with high spinal analgesia, high levels are not essential as a basis for it. This is probably the mechanism responsible for many of the deaths wherein the anesthetist turns the patient supine and suddenly notices he is in extremis. The sympathetic vasomotor fibers are so quickly anesthetized[2,3] that circulatory collapse follows abruptly after the subarachnoid injection.

A slight or moderate fall in arterial pressure is seen so frequently with this method that it occasions no alarm when it occurs in the healthy patient. Severe hypotension is dangerous and is especially liable to occur in elderly, toxic or debilitated patients. Dehydration, chemical imbalance, anemia, hemorrhage or shock invites hazardous blood pressure levels with spinal anesthesia. Patients with marked hypertension or hypotension ("normal hypotension" excluded) may show startling pressure depressions. Severe hypotension brings the danger of insidious hypoxic cerebral changes, unconsciousness and perhaps death if the situation is not recognized and active treatment instituted. In most hospitals ephedrine, desoxyephedrine, neosynephrine or other drugs are injected intramuscularly to combat this pressure fall, but these cannot be relied upon to prevent it in all patients.

The cause of hypotension from subarachnoid block has been the subject of much investigation and speculation. It appears to be due primarily to paralysis of the segmental sympathetic vasoconstrictors in the anterior nerve roots with increased capacity of the vascular bed.[4–6] A vicious cycle (Fig. 1) is established within the cardiovascular system.[7] The vaso-

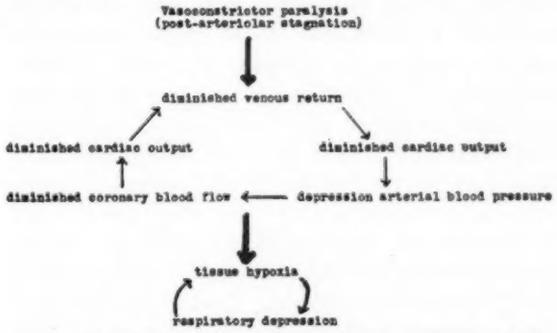

FIG. 1. Cycle of events during spinal anesthesia which may lead to peripheral circulatory failure with cerebral and medullary hypoxia.

dilatation with stagnation of blood in the postarteriolar bed[8,9] results in inadequate venous return and diminished cardiac output. This causes a diminution of the activity of the respiratory and vasomotor centers due to hypoxia. With the fall of arterial pressure there is a decrease in coronary circulation which still further reduces cardiac output. The efficacy of the emergency vasomotor reflexes initiated by the pressor receptors of the carotid and aortic sinuses is greatly diminished because of the sympathetic vasoconstrictor paralysis in the anesthetized area. The respiratory center is reflexly stimulated by the impulses from these pressor receptors and from the chemoreceptors of the carotid and aortic bodies. The chemoreceptors are activated by hypoxia. Respirations may thus at first be stimulated, then depressed and finally cease from central failure. The cerebral hypoxia brings unconsciousness and death.

There are several warning signs which if present should be recognized as indicating the onset of this type of reaction. The patient may yawn and appear quite sleepy. A talkative patient may become quiet. The face becomes expressionless and fixed in feature. He may vomit or complain of nausea and weakness. Sometimes excessive sweating about the head and upper extremities occurs. Pallid cyanosis makes its appearance as the peripheral circulation fails.

Examples of this type of reaction which

were promptly treated avoiding possible death may be cited:

CASE I. A sixty-eight year old female was to undergo an exploratory laparotomy because of a malfunctioning gastroenterostomy which had been done for pyloric obstruction several months before. The patient had tolerated closure of a cecostomy under spinal anesthesia ten days before the present operation. Twelve milligrams of pontocaine in 10 per cent glucose had been injected after 50 mg. of ephedrine intramuscularly. The blood pressure had fallen from 120/70 to 110/60 at the onset of anesthesia and the pulse had risen from 100 to 120.

Preoperative examination the night before the proposed operation revealed an alert woman sitting comfortably in bed. There was evidence of moderate weight loss but she did not appear especially ill or toxic. Examination of the heart and lungs revealed no abnormality. Hemoglobin was 14.0 gm.; examination of the urine was negative. The blood pressure was 85/50. Because of the hypotension for which there appeared to be no apparent cause it was decided to re-evaluate the patient just before operation. Premedication consisted of $\frac{1}{8}$ gr. morphine sulfate and $\frac{1}{200}$ gr. scopolamine hydrobromide given subcutaneously one hour before operation. The blood pressure before operation was 100/60; the pulse was 100. The patient was not unduly narcotized and the color was pink. Because of difficulty anticipated in performing the surgery it was deemed advisable to employ fractional spinal anesthesia supplemented with cyclopropane. After the injection of 50 mg. of ephedrine intramuscularly 2.5 cc. of 0.4 per cent pontocaine in 6 per cent glucose were administered through a Tuohy catheter. The onset of the anesthesia was prompt and the level was found to be at T6. In a few minutes the patient began to appear sleepy. The skin of the face was pale and slightly cyanotic. Blood pressure was 70/30. Oxygen was given with the anesthesia apparatus. Respirations were at first adequate but quickly became rapid and reduced in volume so that assistance by manual compression of the bag was necessary. The patient was almost unconscious but grimaced when the skin of the upper thorax was pinched. The blood pressure now could not be ascertained. Ten milligrams of desoxyephedrine were injected intravenously and plasma started. Within a few minutes the blood pressure rose to 60/20 and then to 80/30. Respirations were still inadequate without assistance even though oxygen was continued. The level of analgesia was located at T5. Operation then proceeded. Carcinomatosis from carcinoma of the stomach was found. Biopsy was taken and the wound closed. At the end of the operation the patient was mentally alert, the pressure was 90/50, the pulse 110 and the respirations adequate.

This case demonstrates severe hypotension with respiratory inadequacy. Possible anesthetic death was avoided by vigorous treatment to break the cycle of increasing hypoxia.

CASE II. A thirty-three year old woman was to have a cesarean section because of cephalopelvic disproportion. Pregnancy had been uneventful. Physical examination was negative except for a mild upper respiratory infection. Hemoglobin was 12.0 gm., red blood cells 4,260,000 and white blood cells 13,600. Premedication consisted of $\frac{1}{150}$ gr. atropine one hour before operation. After the intramuscular injection of 50 mg. of ephedrine 10 mg. of pontocaine (q.s. ad 3.0 cc.) with 10 per cent dextrose were injected at L3. When the patient was turned supine, she appeared pale and listless. The blood pressure could not be ascertained. Oxygen by mask was begun. Respirations were extremely deep and slightly increased in rate. The level of sensory analgesia was found at T8. Within one minute, while an intravenous drip was being started, it was noted that the patient was unconscious and did not respond to auditory or painful stimuli. The skin of the face showed pallid cyanosis. Twenty milligrams of desoxyephedrine were given intramuscularly and 10 mg. intravenously. Respirations continued rapid and deep. Within a few minutes the blood pressure returned to 60/30 and the patient regained consciousness. The anesthetic level was at T6. The blood pressure gradually rose to 90/50 and the operation proceeded as planned.

In this case in spite of oxygen administration the patient became unconscious and might well have gone on to death. A vasopressor drug and immediately available intravenous fluid halted the cycle of increasing cerebral and medullary hypoxia. Elevation of both legs would probably have helped combat this reaction.

CASE III. A healthy thirty-four year old male was given spinal anesthesia for a hydrocele operation. One hundred fifty milligrams of

procaine in 1.5 cc. of cerebrospinal fluid were injected at the third lumbar interspace by a house officer in the absence of the anesthesiologist. The patient was immediately placed supine with a large pillow under his head. The Trendelenburg position was not used. About three minutes after the injection, while the house officer was donning his sterile gown, the anesthetist entered the room and noted that the patient was unusually quiet. His face was placid and his color somewhat pale and cyanotic. Rapid testing by pinching showed anesthesia at least to the cervical region. A blood pressure cuff had not been put on. The pulse was extremely rapid and weak at the carotid artery and impalpable at the radial artery. Oxygen by mask was immediately begun. While desoxyephedrine was being prepared the patient became extremely uncooperative and struggled against the mask. Desoxyephedrine, 20 mg., was given intravenously and a sphygmomanometer applied. The blood pressure was 70/30 at this time. Within two or three minutes the blood pressure was 115/70. The color of the skin became pink but it was noted that the patient was unconscious and the eyes fixed in external strabismus. Automatic respirations ceased. In spite of adequate blood pressure and artificial respiration with 100 per cent oxygen the patient remained unconscious for twenty minutes. When he awoke, respirations were gradually resumed. He was unable to move his extremities and was totally analgesic. Within ten minutes the paralysis had receded to the lower thoracic segments and the analgesia to the mid-thoracic region. He was then returned to the ward and operated upon two days later under pentothal® and nitrous oxide–oxygen anesthesia.

This case demonstrates the hazard of lack of observation of the patient and inadequate familiarity with the method on the part of the operator. It represents a combination of the first and second mechanisms. The hypotension with its ensuing hypoxia undoubtedly caused the extreme restlessness and resistance to oxygen therapy. The respiratory failure, unconsciousness and external strabismus persisting in spite of oxygen by artificial respiration and a reasonable blood pressure indicate a powerful effect of procaine in the cervical nerve roots and the central nervous system.

On questioning the house officer it was learned that the patient had had three severe paroxysms of coughing during the first minute after intrathecal administration. Apparently the cough increased the intra-abdominal and subarachnoid pressures and spread the concentrated anesthetic agent so rapidly that the cerebrum was also affected by the drug.

INTRAVASCULAR INJECTION

Intravascular injection is probably very rare. It is possible to inject the anesthetic solution into one of the veins of the internal vertebral venous plexus although if proper technic is employed it would be difficult to imagine how this accident could happen. When a bloody tap is noted, the needle must be readjusted until clear fluid is obtained. While the anesthetic solution is being injected, occasional aspiration will confirm the fact that the needle tip is properly placed. The reactions from rapid intravenous injection may be of two types, namely, the neurologic type and the circulatory type. In the neurologic type the cerebral-stimulating action of the anesthetic drugs is demonstrated by talkativeness, excitement and convulsions. Treatment consists of oxygen inhalation, artificial respiration if necessary and slow intravenous administration of a short-acting barbituate such as pentothal® until the reaction is controlled. In the circulatory type the reaction is characterized by a fall in blood pressure, pallor, sweating, nausea and vomiting, and air hunger. Treatment consists of oxygen administration, artificial respiration if necessary, intravenous analeptics such as epinephrine or ephedrine, and intravenous fluids.

DRUG SENSITIVITY

True idiosyncrasy to cocaine substitutes such as procaine, pontocaine and metycaine is rare. It is believed that perhaps 1 in 200,000 individuals shows a true idiosyncrasy to procaine. If, however, a patient has had a reaction to local procaine at a previous operation as for teeth extraction, it is judicious to test the agent intracutaneously. A control wheal of physiologic saline is made on the forearm and a 1 per cent procaine solution (or dilute solution of other suspected drug) is made nearby. After five minutes one may assume some sensitivity if there is increased redness about the test wheal. Another drug such as metycaine or

monocaine may be tested and usually will prove satisfactory.

Often the sensations of faintness, palpitation, dyspnea, tremors and nervousness during local anesthesia are due solely to the vasoconstrictor drug in the anesthetic solution. This may easily be tested by subcutaneous injection of a minute dose of the vasoconstrictor. The patient will complain of similar symptoms if the test is positive.

ACTION OF THE DRUG DIRECTLY ON THE MEDULLARY CENTERS

Direct action of the anesthetic drug on the medullary centers leading to respiratory and vasomotor failure has been considered by some as the basis for untoward reactions from spinal anesthesia. Direct action on the medulla may probably be excluded as a mechanism of untoward reactions in man since Koster[10] proved that extremely high concentrations of anesthetic drugs must be applied directly to these centers to bring about paralysis in animals.

REACTIONS WHICH MAY OR MAY NOT BE ASSOCIATED WITH OR BE SECONDARY TO THE METHOD

Reactions during spinal anesthesia occur so suddenly that often there is too little time to determine what has happened. Death may have nothing to do with the spinal anesthesia and may be merely coincidental. A similar reaction might have occurred under intravenous or inhalation anesthesia or even without surgical or anesthetic intervention. The great value of postmortem study is confirmed in many of these operating room deaths.

Case IV. A seventy-nine year old man with complete pyloric obstruction was to have a gastroenterostomy performed as a palliative procedure. On preoperative examination the evening before operation asthmatic wheezes could be heard throughout both lungs but more noticeably at the left base. Since the patient was receiving a blood transfusion at the time, it was thought that the wheezes represented an allergic transfusion reaction. The blood was discontinued. The patient coughed several times when placed on the operating table in the morning. The color was pink, the blood pressure normal and the pulse not rapid. A fractional spinal anesthetic was begun. There was no fall in blood pressure and respirations were full and regular. A hypnotic dose of pentothal® was given intravenously into the infusion tubing, oxygen was administered by mask and the operation begun. After about fifteen minutes the patient suddenly became pale and cyanotic. Blood pressure could not be ascertained. The carotid pulse was very weak and rapid. Respirations, which at first were very deep and rapid, gradually ceased as the pulse disappeared. Resuscitation by artificial respiration, intravenous fluids and vasopressor drugs were of no avail.

The anesthetist believed that this was not a true anesthetic death although he had no diagnosis which he could make with certainty. Postmortem examination showed multiple pulmonary infarcts from previous small emboli and two recent large emboli blocking both pulmonary arteries. This death might have occurred at any time but it cannot be denied that the anesthetic may have precipitated the accident on the operating table.

I have heard of three cases of non-fatal pulmonary embolus occurring in conjunction with lumbar sympathetic block for phlebitis of the legs. In one instance the acutely flexed position of the thigh apparently freed a propagating thrombus and the patient experienced a pulmonary embolus before injection. In the second case the embolus occurred during the injection of the lumbar ganglia. In the third the embolus apparently occurred on the ward after the anesthetic block. It is quite possible that the acutely flexed position or the sudden dilatation of the veins of the pelvis and lower extremities during spinal anesthesia might free a thrombus.

Cerebral thrombosis may occur during or immediately after spinal anesthesia. Hypotension even if present for only a short time during the induction of analgesia or during operation as a result of reflexes or position may reasonably be blamed for the accident, especially in elderly, arteriosclerotic patients. The hypotension may slow the cerebral blood flow to permit a thrombus to form within the sclerotic vessels. Efforts to maintain a satisfactory level of blood pressure will help insure an adequate cerebral circulation.

Coronary occlusion and/or ventricular fibrillation may occur during spinal anesthesia or during operation. The coronary blood flow depends primarily upon the diastolic blood pressure. A precipitous fall in arterial pressure

may render the myocardium ischemic and lead to various irregularities in rhythm. Slow coronary flow and low pressure may predispose to thrombosis. Reflexes from the operating field, particularly in the upper abdomen, may induce coronary constriction and increase the myocardial ischemia. If there is coronary sclerosis or pre-existing myocardial damage, acute anemia may cause heart failure. Case v[11] demonstrates cardiac arrest under spinal anesthesia supplemented with pentothal.®

CASE V. A twenty-five year old woman was given spinal anesthesia for appendectomy and right salpingo-oophorectomy. Hypnosis was maintained with pentothal.® The first forty-five minutes of operation were uneventful. As the omentum was replaced in the pelvis and preparation made to close the peritoneum, the patient suddenly became ashen gray and respirations ceased. Artificial respiration with oxygen by the anesthesia apparatus was immediately begun. There were no palpable pulsations in the abdominal aorta or heart. The heart was massaged through the diaphragm, 20 mg. of desoxyephedrine injected intravenously and finally 0.5 cc. of 1:1000 epinephrine administered into the heart. After about three minutes of arrest strong cardiac contractions were resumed and the blood pressure returned to 120/80. The operation was completed as quickly as possible. The patient was discharged well on the nineteenth postoperative day without residuals.

Cardiac arrest may occur during operation under any anesthetic. One cannot indict the method of anesthesia, yet it may have contributed to this untoward reaction.

SUMMARY

Immediate untoward reactions to spinal anesthesia have been considered from the standpoint of prevention, recognition and treatment. The pathologic physiology leading to the reactions has been discussed and illustrative cases of the more common types of accidents have been presented.

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PERFORATION OF THE GALLBLADDER*

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THE subject of perforation of the gallbladder has been one of peculiar interest to the general surgeon for many years perhaps because of the relative infrequency of occurrence, the difficulty of preoperative diagnosis, the high mortality associated with the condition in the past and the bearing which it has upon the vigorously contested question of early versus delayed operation in acute cholecystitis.

In 1934 Eliason and McLaughlin[5] reviewed the cases of perforation of the gallbladder encountered on one of the surgical services of the Hospital of the University of Pennsylvania over a period of eleven years. This complication occurred nine times among 490 consecutive admissions for disease of the biliary tract. In none of these was there acute, free perforation with widespread bile peritonitis. There was one death, a mortality rate of 11 per cent.

It is the purpose of this article to bring this experience up to date with a report of the cases diagnosed at the Hospital of the University of Pennsylvania during the fifteen-year period from 1934 through 1948. The report is based upon forty-four instances of perforation of the gallbladder encountered among 2,807 operations for acute or chronic cholecystitis.

Classification. The accurate classification of cases of perforation of the gallbladder is of primary importance because of the wide difference in mortality in different groups. Using Niemeier's method[14] of classification our forty-four cases are divided as follows: Type I, acute free perforation into the peritoneal cavity (five cases); Type II, subacute perforation with pericholecystic abscess (twenty-five cases); Type III, chronic perforation with cholecystoenteric fistula (fourteen cases).

Traumatic perforations and perforations due to malignant neoplasms have been excluded from consideration. No instance of perforation with the formation of an external biliary fistula was encountered.

Incidence. The incidence of perforation of the gallbladder as reported by various authors has been summarized by Cowley and Harkins.[3] In a collected series of 12,915 gallbladder cases there were 433 perforations, an incidence of 2.8 per cent. Among 2,261 reported cases of acute cholecystitis the incidence of perforation was 13.0 per cent. In their own series of 2,750 gallbladder operations perforation had occurred in twenty-five or 0.9 per cent. The incidence was 4.7 per cent in a series of 490 operations for acute cholecystitis.

Table 1

INCIDENCE OF PERFORATION OF THE GALLBLADDER

Total gallbladder operations	2,807
Total cases of perforation	44
Per cent	1.6
Operations for acute cholecystitis	600
Acute and subacute perforations	30
Per cent	5.0

The present series consists of 2,807 operations for acute or chronic disease of the gallbladder. Perforation of the gallbladder was encountered forty-four times in this series, an incidence of 1.6 per cent. The series includes approximately 600 cases of acute cholecystitis. The thirty cases of acute and subacute perforation represent 5 per cent of this number. (Table 1.)

It is obvious that perforation of the gallbladder is not a common occurrence, but it is well to remember that at least 5 to 10 per cent of cases of acute cholecystitis will progress to gangrene and perforation if operation is unduly delayed.

Mortality. The mortality rates for perforation of the gallbladder reported in the literature vary widely and defy interpretation chiefly because many authors have failed to describe accurately or to classify their cases. Heuer[12] in 1934 summarized 502 instances of perforation of the gallbladder reported by twenty authors. Eight of these recorded their mortality figures which ranged from 33.3 to 100 per cent. Glenn[9] in a review of the literature from 1934 to 1946 found reports of twenty-five authors recording an additional 457 cases. The mortality figures recorded by twenty-two authors ranged from

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5.8 to 75 per cent. Cowley and Harkins[3] in their collected series of 433 cases found an average mortality rate of 20.8 per cent with extremes from 5.8 to 66.6 per cent.

More significant figures are those of Blain and Harkins[2] who collected the reports of ten authors who had classified their cases as free or localized perforations. There were 108 free perforations with a mortality rate of 42 per cent and 152 localized perforations with a mortality rate of 10 per cent.

We have reviewed the reports of five authors who divided their cases according to the classification of Niemeier[14] as used in this paper. The results are found in Table III. There were sixty-seven cases of Type I (acute, free perforation) with a mortality of 35.8 per cent; 104 cases of Type II (subacute perforation with pericholecystic abscess) with a mortality of 8.7 per cent and thirty-three cases of Type III (chronic perforation with cholecystoenteric fistula) with a mortality of 42.4 per cent.

The results in the present series are shown in Table II. There were five cases of Type I with two deaths (40 per cent), twenty-five cases of Type II with one death (4 per cent) and fourteen cases of Type III without a death. The overall mortality for the total of forty-four cases was 6.8 per cent. The figures are similar to those in the reported series except for the Type III cases for which most surgeons have reported a high mortality rate.

Type I, Acute, Free Perforation. In our series acute, free perforation of the gallbladder was a rare occurrence encountered only five times in a period of fifteen years. This represents an incidence of 11.4 per cent of the forty-four perforations and 0.18 per cent of the total of 2,807 gallbladder operations. This figure is considerably lower than that shown in the collected series in Table III in which free perforations comprised 32.8 per cent of the total. The latter figure is chiefly due to the large number of free perforations reported by Bachhuber and associates[1] from the Los Angeles County Hospital.

It will be noted from Table IV that the average age of our patients was fifty-six, with a range from forty-one to seventy-three. All of our patients were males, a striking contrast to the usual incidence of gallbladder disease which is several times more common in the female. This disproportion has been noted by others.[3,11,17] Three of the five patients had had no clear history of chronic cholecystitis. The acute symptoms in three cases were of less than forty-eight hours' duration at the time of operation. On physical examination a mass was palpable in the right upper quadrant in only two instances. There was moderate generalized abdominal tenderness and rigidity in all cases, but the signs were much less marked than one might have anticipated. Fever and leukocytosis likewise were strikingly low. The average temperature on admission was 100.2°F. and the average leukocyte count was 12,300.

TABLE II
PERFORATION OF THE GALLBLADDER
CLASSIFICATION AND MORTALITY RATES

Classification	No. of Cases	Per cent	Deaths	Mortality (Per cent)
Type I				
Free perforation	5	11.4	2	40
Type II				
Pericholecystic abscess	25	56.8	1	4
Type III				
Cholecystoenteric fistula	14	31.8	0	0
Total	44	100	3	6.8

The preoperative diagnosis of perforation of the gallbladder was made with some degree of assurance in only one instance. It was suspected in two more cases. The remaining two cases were diagnosed preoperatively as acute pancreatitis and peritonitis due to perforation of the appendix. Three of the patients were operated upon within four hours of the time they were first seen by a member of the surgical staff. One of these patients who was under treatment on the medical ward for severe myocardial disease died after operation as a result of cardiac decompensation, pleural effusion and pulmonary complications. Operation upon two patients was delayed in one instance for three days with a diagnosis of acute pancreatitis which appeared to be subsiding and in another instance for six days with a diagnosis of peritonitis due to a perforated appendix which seemed to be localizing to the right side of the abdomen. The first patient died and the second survived, probably because there was some degree of localization of the bile and pus although no true abscess was present.

Operation in every case disclosed large quantities of bile and pus in the peritoneal cavity without evidence of localization to the pericholecystic area. A perforated gallbladder was definitely identified in four cases. In one instance the gallbladder was not actually visualized and the patient's condition was so desperate that the peritoneal cavity was simply cleansed by aspiration and the abdomen closed around multiple drains. In the remaining four cases the operation consisted of cholecystostomy and drainage after aspiration of free bile and pus.

Cultures were done in three cases and grew out hemolytic streptococcus in one and Bacillus coli in the other two. Two patients were treated before the era of chemotherapy, with one survival and one death. Three patients were given sulfadiazine, penicillin or both, and one of these patients died. Of the three patients who survived two returned to the hospital in two to three months for cholecystectomy and choledochostomy because of further symptoms and the third was perfectly well when last seen two years after operation.

Type II, Subacute Perforation with Pericholecystic Abscess. In our experience this was the commonest type of perforation of the gallbladder. The twenty-five cases encountered comprised 56.8 per cent of the perforations in the series and 0.89 per cent of the total of 2,807 gallbladder operations. There was only one death in this group, a mortality rate of 4 per cent. The collected series (Table III) shows comparable data. There are 104 cases of Type II comprising 51 per cent of the perforations, with a mortality rate of 8.7 per cent.

The average age of this group of patients was fifty-seven, with a range from thirty-one to seventy. (Table IV.) There were thirteen males and twelve females in the series again emphasizing the tendency to find a disproportionate number of male patients exhibiting the complications of acute cholecystitis.

Five patients gave no history of previous gallbladder disease. The remainder gave fairly typical histories of chronic cholecystitis over periods varying from six weeks to thirty years. Four patients had had previous operations for gallbladder disease. In three cases cholecystostomy had been done six, seven and seventeen years, respectively, before the episodes of perforation. One patient had had two operations, cholecystostomy thirty-four years

TABLE III

PERFORATION OF THE GALLBLADDER—COLLECTED SERIES, CLASSIFICATION AND MORTALITY RATES

Authors	Type I				Type II				Type III			
	No. of Cases	Per cent	Deaths	Mortality	No. of Cases	Per cent	Deaths	Mortality	No. of Cases	Per cent	Deaths	Mortality
Sanders[14]	4	8.7	2	50	36	78.3	2	5.5	6	13.0	4	66.6
Glenn and Moore[10]	3	11.5	2	66.6	22	84.6	1	4.5	1	3.9	0	0
Cowley and Harkins[3]	6	24.0	1	16.6	16	64.0	4	25	3	12.0	1	33.3
Bachhuber, Deeb and Taylor[1]	45	57.7	14	42.4	18	23.1	2	11.1	15	19.2	6	46.2
Blaine and Harkins[2]	9	31.0	5	55	12	41.4	0	0	8	27.6	3	38
Total	67	32.8	24	35.8	104	51.0	9	8.7	33	16.2	14	42.4

Five patients gave no history of previous gallbladder disease. The remainder gave fairly typical histories of chronic cholecystitis over

TABLE IV

PERFORATION OF THE GALLBLADDER

AGE, SEX, PREVIOUS HISTORY OF CHRONIC CHOLECYSTITIS

	Age		Sex		Previous History of Chronic Cholecystitis (Per cent)
	Average	Range	Male	Female	
Type I	56	41–73	100	0	40
Type II	57	31–70	52	48	80
Type III	63	56–72	21	79	64

previously and cholecystostomy and choledochostomy twenty-one years previously. Acute symptoms were absent in four cases but the remaining twenty-one patients presented symptoms quite typical of acute cholecystitis, namely, right upper quadrant pain, frequently radiating to the back, accompanied with nausea and vomiting. It is interesting that five patients gave a history of chills and fever for one to five weeks before admission. Such a history combined with the picture of acute gallbladder disease should certainly suggest the diagnosis of perforation of the gallbladder with pericholecystic abscess. One patient was deeply jaundiced and proved to have calculi in the common duct as well as a gangrenous, perforated gallbladder and a large pericholecystic abscess. Four additional patients had mild elevation of the serum bilirubin level doubtless due to the acute inflammatory process.

Physical examination revealed a palpable abdominal mass in the right upper quadrant in twelve cases and in all except two instances there was definite right upper quadrant tenderness to palpation. The average admission temperature was 100°F. with a range from 98° to 104°, and the average white blood cell count was 13,600, with a range from 5,500 to 30,000. The preoperative diagnosis was chronic cholecystitis in five cases and acute cholecystitis in seventeen, with perforation suggested as a definite possibility in three of these. Of the remaining three cases two were diagnosed as liver abscess and one as subhepatic abscess.

The pathologic findings at operation conformed closely to the clinical picture. In those patients diagnosed preoperatively as chronic cholecystitis there was a small abscess containing a few cc. of thick pus lying adjacent to a chronically diseased, contracted gallbladder, obviously the result of the perforation of the gallbladder on some previous occasion. The remainder of the patients who presented a clinical picture of acute or subacute inflammation showed at operation various stages of gangrene of the gallbladder and pericholecystic abscesses which contained anywhere from a few cc. to 300 cc. of pus or bile. Five of the perforations had occurred into the liver. The other abscesses were within the peritoneal cavity adjacent to the gallbladder and were walled off by omentum and the transverse colon. In three instances perforation had occurred immediately adjacent to the cystic duct. Calculi were found in the gallbladder or in the abscess cavity in all except three cases. Two of these patients were later subjected to cholecystectomy and stones were found in the gallbladder at that time.

The operative procedure consisted of simple drainage of the abscess in five instances in which a completely gangrenous gallbladder was not identified clearly in a large abscess. In fifteen cases cholecystostomy and drainage were done. Five patients were subjected to cholecystectomy. In two instances the common duct was explored through the stump of the cystic duct.

Cultures of the abscess contents were negative in two cases and showed B. coli in six, Aerobacter aerogenes in four, non-hemolytic streptococcus in two, hemolytic staphloccus aureus in one, Friedlander bacillus in one and Streptococcus viridans and an unidentified clostridium in one. From the standpoint of chemotherapy the sulfonamides alone were given to three patients and penicillin alone or in combination with the sulfonamides or streptomycin was used for six more.

Most of the patients had a surprisingly smooth postoperative course. One patient died twenty-four days after drainage of a large pericholecystic abscess. Biliary and intestinal fistulas developed and there was a strong but unproved suspicion that a malignant neoplasm might have formed the basis for the perforation and subsequent course. One other deeply jaundiced patient sixty-five years of age had a stormy course due to the presence of calculi in the common duct which eventually were removed at a second operation.

Nine of the twenty-five patients were later readmitted for further surgery. Cholecystectomy and choledochostomy were done in three cases and cholecystectomy alone in six.

Type III, Chronic Perforation with Cholecystoenteric Fistula. This group of cases presents a problem which is quite different from that encountered in the more acute perforations of Type I and Type II. Nevertheless it represents an end stage of the same pathologic process and for this reason a summary of our experience is included. The subject has been reviewed recently by Hicken and Coray[13] and by Noskin et al.[15]

Our series includes fourteen examples of chronic perforation of the gallbladder with the formation of an internal biliary fistula, com-

prising 31.8 per cent of the total of forty-four perforations. (Table II.) There were no deaths in this series. These figures are in marked contrast to those shown in Table III for the collected series in which the incidence was only 16.2 per cent of the total perforations and the mortality was 42.4 per cent. It should be noted here that in 1941 Eliason and Stevens[7] reported from this hospital an earlier group of five cases with a mortality of 60 per cent. Only one of these cases is included in the present series.

As indicated in Table IV these patients are all in the older age group. The average age is sixty-three and the range is from fifty-six to seventy-two. Eleven of the fourteen patients are women, exactly the opposite of the marked preponderance of male patients found in the group of acute, free perforations. The cases are naturally subdivided into two groups: those in which the presenting symptom was acute intestinal obstruction due to a gallstone and those in which a fistula was discovered in the course of an operation for chronic gallbladder disease.

Intestinal obstruction caused by gallstones is a relatively rare condition. Foss and Summers[8] encountered ten cases in a period of twenty-five years among 2,720 gallbladder admissions and collected 140 cases from the literature over a twenty-year period. Wakefield, Vickers and Walters[18] reported only ten patients treated at the Mayo Clinic. At the University of Pennsylvania Hospital there have been five cases in a period of fifteen years. Only one of these patients gave a definite history suggestive of previous gallbladder disease. The average duration of the acute episodes of crampy abdominal pain and vomiting was seven days prior to admission and in no case was severe abdominal distention noted on physical examination. Slowly developing, incomplete small intestinal obstruction is characteristic of gallstone ileus. The preoperative diagnosis in each case was small intestinal obstruction the nature of which was only determined at operation when a large gallstone was found obstructing the terminal ilium in four cases and the distal jejunum in one case. In two cases the operator was able to palpate a chronically diseased gallbladder containing stones. In one case only adhesions were felt and in two cases the gallbladder region was not explored. It was assumed in each case that the gallstone had entered the intestinal tract through a cholecystoduodenal or a cholecystogastric fistula. In only one case was this proved at a later operation when a cholecystoduodenal fistula was demonstrated and cholecystectomy was performed. All five patients recovered promptly after simple removal of the obstructing stone.

The group of nine patients whose internal biliary fistulas were demonstrated at operation for chronic biliary tract disease present some interesting contrasts to the gallstone ileus group. All except one of these patients gave a long history of chronic gallbladder disease over periods varying from two years to thirty-five years with an average duration of eighteen years. Two patients had had a cholecystostomy respectively twenty-nine and twenty-five years previously. Six of the nine patients gave a definite history of jaundice or were jaundiced on admission and this symptom was accompanied with chills and fever in four cases. At operation stones were found in the common duct of four of the six patients with a history of jaundice. Undoubtedly jaundice, chills and fever were partly attributable to the cholangitis associated with the presence of the biliary fistula as well as to the obstruction of stones in the common duct. The diagnosis of cholecystoenteric fistula was made preoperatively in only one case, a patient with a history of chronic cholecystitis for thirty-five years who had passed a large stone per rectum two years previously after an episode of partial obstruction and who presented on admission the typical picture of Charcot's intermittent hepatic fever and jaundice.

At operation a chronically diseased gallbladder was found in every case and calculi were described in seven of the nine cases. The common duct was explored in six cases and calculi were found in four. A fistula was demonstrated from the fundus of the gallbladder to the duodenum in four cases, to the colon in three cases, to the stomach in one case and to the common duct in one case. In a review of 141 cases of cholecystoenteric fistula seen at the Mayo Clinic Wakefield and associates[19] found 101 between the gallbladder and duodenum, thirty-three between the gallbladder and colon and seven between the gallbladder and stomach. These authors noted that the patients with fistulas into the colon are usually the most seriously ill, with severe chills, high fever, diarrhea and weight loss. This was only partly

true in our series, however, since the patient with the most severe cholangitis had a fistula into the duodenum.

The operation consisted of cholecystectomy, choledochostomy and closure of the fistula in six cases. In two cases cholecystectomy or cholecystostomy and closure of the fistula were done. In the case of the fistula between the gallbladder and the common duct the gallbladder was simply opened and the stones removed, the fistula being left intact. All of the patients made a good recovery and all were well when last seen a few months to several years later.

COMMENT

The review of these clinical data suggests several problems for consideration. In the first place, what part does perforation of the gallbladder play in the surgical mortality of gallbladder disease? Reviewing the literature in 1934 Heuer[12] estimated that 10 per cent of deaths following gallbladder operations were due to gangrene and perforation and he found a similar incidence of 11 per cent in the New York Hospital series of 1,000 cases. As demonstrated by Table v our experience is quite similar. Of twenty-nine deaths following biliary tract surgery three or 10.3 per cent were due to perforation. Following operations for acute cholecystitis 15.4 per cent of the deaths were due to perforation. It is evident, therefore, that a significant fraction of the mortality of cholecystitis is due to perforation.

Is it possible to reduce or eliminate perforation as a factor in the mortality of acute cholecystitis? We believe that the incidence of serious complications can be reduced with early surgical intervention in cases of acute cholecystitis. Glenn and Heuer[10] report a series of 527 cases of acute cholecystitis treated with early operation with a mortality of 2.46 per cent. Only one of the thirteen deaths was due to perforation. Eliason and Stevens[6] in 1944 reported from this hospital a series of 135 cases of acute cholecystitis many of which are included in this report. Adhering to a policy of early operation they achieved a mortality rate of 1.5 per cent and neither of the two deaths was due to perforation although there were seventeen instances of localized perforation with the formation of a pericholecystic abscess.

The general policy of early operation has been followed in this clinic for many years and doubtless accounts in part for the relatively low incidence and mortality of perforation of the gallbladder which we are able to report. However, this study emphasizes that the principal mortality now lies in the group of acute, free perforations. These patients frequently give no clear previous history of cholecystitis and perforation may occur within forty-eight hours of the onset of the acute symptoms, often before the patient reaches the hospital or the surgical consultant. There is little hope of anticipating or preventing such catastrophes, but prompt operation after perforation—aided by modern chemotherapy and supportive measures—will result in the recovery of many of these patients.

TABLE V

EFFECT OF DEATHS DUE TO PERFORATION OF THE GALLBLADDER UPON THE MORTALITY OF OPERATIONS FOR GALLSTONE DISEASE

	No. of Cases	Per cent
Total Operations for Gallstone Disease	2,807	.....
Total deaths	29	1.03
Deaths due to perforation	3	10.3
Total deaths minus deaths due to perforation	26	0.93
Operations for Acute Cholecystitis	600	.....
Deaths in acute cholecystitis	13	2.2
Deaths in acute cholecystitis due to perforation	2*	15.4
Deaths in acute cholecystitis minus deaths due to perforation	11	1.8

* Only two of the three deaths due to perforation are included here because one of the patients who died was operated upon with a diagnosis of chronic cholecystitis and the finding of an old pericholecystic abscess, the result of a previous perforation.

Another important approach to this problem is that of interval cholecystectomy for patients who present a history and findings of recurrent episodes of chronic cholecystitis. By far the majority of patients in this series in Group II and Group III and a number of those in Group I gave a definite history of chronic cholecystitis. Simple interval cholecystectomy would have spared these individuals the far greater risks of operation after perforation had occurred.

These data also draw attention to the importance of performing definitive surgery as an elective procedure within a few months after

cholecystostomy is done as an emergency operation. Donald and Fitts[4] recently carried out in this clinic a ten-year follow-up study of eighty-four patients after cholecystostomy. Unsatisfactory results were noted in one-third and five patients died of biliary tract disease.

Analysis of our present series shows that of the forty-four patients with perforation of the gallbladder seven or 15.9 per cent had had cholecystostomy performed from six months to twenty-six years previously. One of these patients died as a result of perforation. Twenty-three patients in this series were treated with cholecystostomy at the time that the diagnosis of perforation was made. Eleven of these patients were subsequently operated upon again, seven because of recurrent difficulty including persistent mucous fistula, acute cholecystitis and jaundice; one because of the demonstration of residual stones in the common duct by cholangiogram and two as an elective procedure on patients with minimal symptoms. Cholecystectomy was done in all eleven cases and choledochostomy in eight. Stones were found in the gallbladder in five cases and in the common bile duct in five cases. In two cases no stones were found. It is now routine practice in this clinic to readmit in three months for definitive surgery all patients who have had cholecystostomy for acute inflammatory disease of the gallbladder unless further surgery is definitely contraindicated by the age or general condition of the patient.

Finally, consideration should be directed to the importance of the greatest attention to detail in the pre- and postoperative care of these elderly patients with serious biliary tract disease. The subject has been reviewed recently by Ravdin.[16] Patients with acute perforation require rapid correction of fluid and electrolyte imbalance, transfusion for shock, immediate parenteral administration of large doses of vitamin K and the initiation of therapy with penicillin and streptomycin as indicated. In less urgent cases a period of high protein diet, parenteral vitamin K and oral vitamin C and vitamin B complex, combined with blood transfusions or other parenteral fluid therapy as required, will do much to fortify the patient against the assault of surgery. The choice of the anesthetic agent is important. In this clinic spinal anesthesia has been the method of choice for most biliary tract surgery, but local anesthesia or inhalation anesthesia with cyclopropane may be elected for some of the elderly patients with advanced cardiovascular changes. Postoperatively one must be alert to prevent phlebothrombosis, atelectasis, ileus and renal or cardiovascular complications.

SUMMARY

In a fifteen-year period forty-four cases of perforation of the gallbladder were encountered among 2,807 operations for acute and chronic cholecystitis. These cases are classified as follows: Type I (acute, free perforation), five cases; Type II (subacute perforation with pericholecystic abscess), twenty-five cases; Type III (chronic perforation with cholecystoenteric fistula), fourteen cases. The mortality rate was 40 per cent for Type I, 4 per cent for Type II and zero for Type III.

Type I or acute, free perforation of the gallbladder is a rare occurrence carrying a high mortality. It is more common in male patients who may have no previous history of gallbladder disease. Physical signs, fever and leukocytosis may be deceptively mild but should be sufficient to justify a diagnosis of an acute abdomen and a decision to operate without delay. Aspiration of the peritoneal cavity, cholecystostomy and drainage is the procedure of choice. In the absence of severe associated disease early operation limited to this simple, essential procedure should result in a reasonably good prognosis.

Type II or localized perforation with the formation of a pericholecystic abscess is the most common sequence in perforation of the gallbladder. Most of the patients are in the sixth decade and most of them give a history of chronic cholecystitis. The immediate clinical picture may be that of acute, subacute or chronic cholecystitis, depending on the time of perforation and the nature of the abscess. A history of chills and fever is suggestive and a mass is palpable in the right upper quadrant in about half of the cases. Cultures of the abscess are usually positive, with the colon bacillus the most common organism. The usual operative procedure is drainage of the abscess and cholecystostomy, but cholecystectomy is often feasible. Convalescence is surprisingly smooth and the mortality is low.

Type III or chronic perforation of the gallbladder with formation of a cholecystoenteric fistula is an uncommon end stage of chronic

gallbladder disease. Most of the patients are in the seventh decade and females predominate. About one-third of the patients are admitted with intestinal obstruction due to a gallstone lodged in the terminal ileum. Slowly developing, incomplete obstruction is characteristic. Recovery is rapid after simple ileotomy and removal of the stone. In the other two-thirds of the patients the fistula is found at operation for chronic cholecystic disease which is usually of many years' duration. Jaundice, chills and fever are common symptoms. Stones are frequently found in the common duct. The duodenum and the colon are the most frequent sites of fistula formation. The results have been excellent after cholecystectomy, closure of the fistula and choledochostomy if indicated.

The incidence and mortality of perforation of the gallbladder can be reduced somewhat by a general policy of early operation for acute cholecystitis and perhaps even more by the practice of elective cholecystectomy for all patients presenting the history and findings of chronic cholecystitis. If cholecystostomy is done during an acute episode, it should be followed with cholecystectomy a few months later.

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NEW APPROACH FOR SUBTROCHANTERIC AND UPPER FEMORAL SHAFT FRACTURES USING A DUAL FLANGE NAIL PLATE

A PRELIMINARY REPORT

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FOR many years orthopedic and fracture surgeons have been searching for the best method for treatment of upper femoral shaft and subtrochanteric fractures. The disadvantages of the dual plating method, the intramedullary procedure and the use of the various blade or plate hip nails are all too well known. The following one-piece appliance has been used in seven cases now, in each of which the fragments have been maintained in good alignment. No plaster casts have been used, and in only two of the cases was any traction used following the operation.

Figures 1 and 2 show the original type of appliance on the left with the longer blade, plate or flange running along the mid-lateral aspect of the femur. Then the shorter arm curves up onto the mid-anterior aspect of the shaft with both arms firmly connected to each other and to the head of the Smith-Petersen nail.

This original model does not have the screw holes in the two plates staggered due to a technical oversight, but the subsequent ones do. This type necessitates a right and left femoral model as it is almost impossible to attach the anterior plate around on the posterior aspect of the upper femur without great destruction of important soft tissues and great difficulty in internally rotating the leg sufficiently.

The later model at the right in Figures 1 and 2 can be used on either the right or left femur. There is, however, some difficulty in obtaining adequate exposure for inserting the screws in the posterior lateral plate in heavy or fat individuals due to the encroachment onto the linea aspera. Further use of these appliances will determine whether one type is better than the other as each has its advantage over the other.

This nail plate has been made of S. M. O. stainless steel and vitallium® with the angle at the neck of the former alterable by bending irons. The usual guide wire and x-ray check-up method is employed for the insertion of this nail into the neck of the femur. There is a good deal of muscle to be separated and retracted in order to expose the upper femoral shaft sufficiently, but no serious bleeding has been encountered to date. An adequate blood transfusion should always be given these patients in the operating room and afterward as needed.

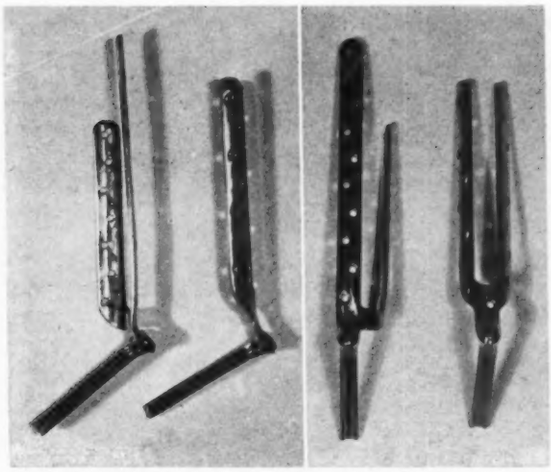
CASE REPORTS

CASE I. A seventy year old female fell on November 12, 1949. She had had Paget's disease for years. On November 14th it was found the patient had a subtrochanteric fracture. Under pentothal® sodium anesthesia a dual flange was applied using five screws in each flange. Progress of the patient was good. (Fig. 3.)

CASE II. A sixty-nine year old male fell from a ladder on January 12, 1950. He sustained inter- and subtrochanteric fractures of the right femur, with Colles' fracture of the right wrist and a long linear skull fracture. Under pentothal® sodium anesthesia the patient was operated upon January 16th, with reduction of his wrist. Postoperatively the patient was up and about with crutches.

CASE III. On January 13, 1950, a male sustained a transverse fracture 1½ inches below the trochanteric line of the left femur by comminuted fractures of the left patella. He was operated upon January 16th. After operation the patient was up and about with crutches, with the left knee in an extension cast and bearing a little weight mainly for balance.

CASE IV. An eighty-six year old female fell on February 8, 1950, sustaining a spiral frac-



1 2

FIG. 1. Dual flange hip nails; side view.
FIG. 2. Dual flange hip nails; top view.

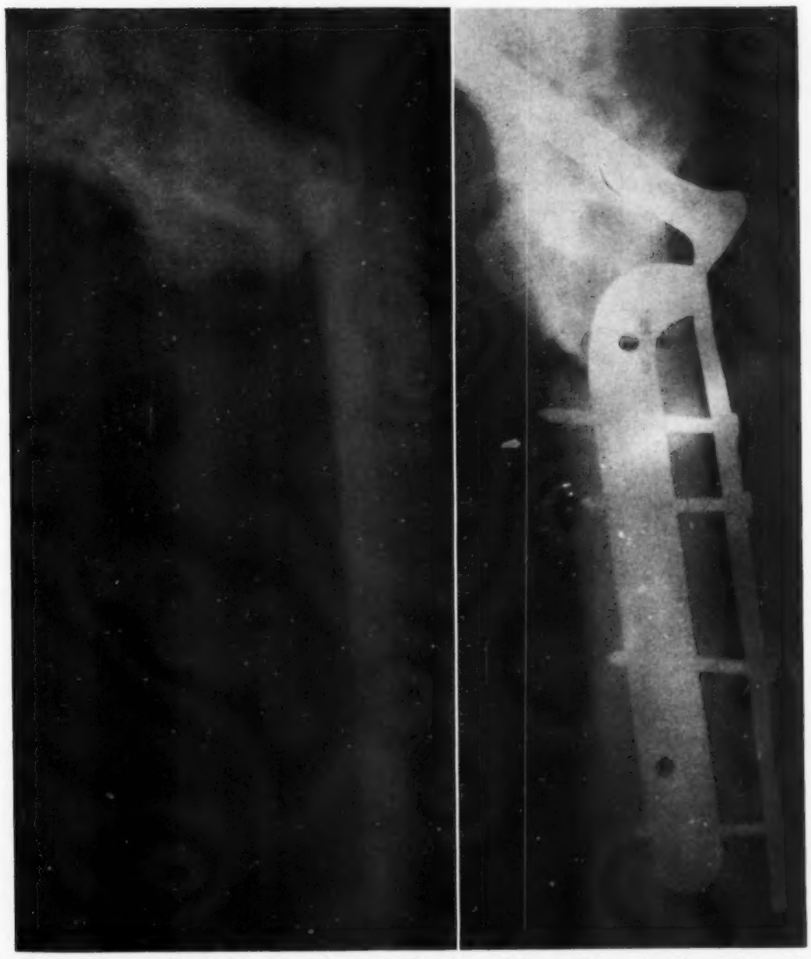


FIG. 3. Case 1. Post-injury and post-reduction with appliance in place; lateral plate tightened to shaft during application.

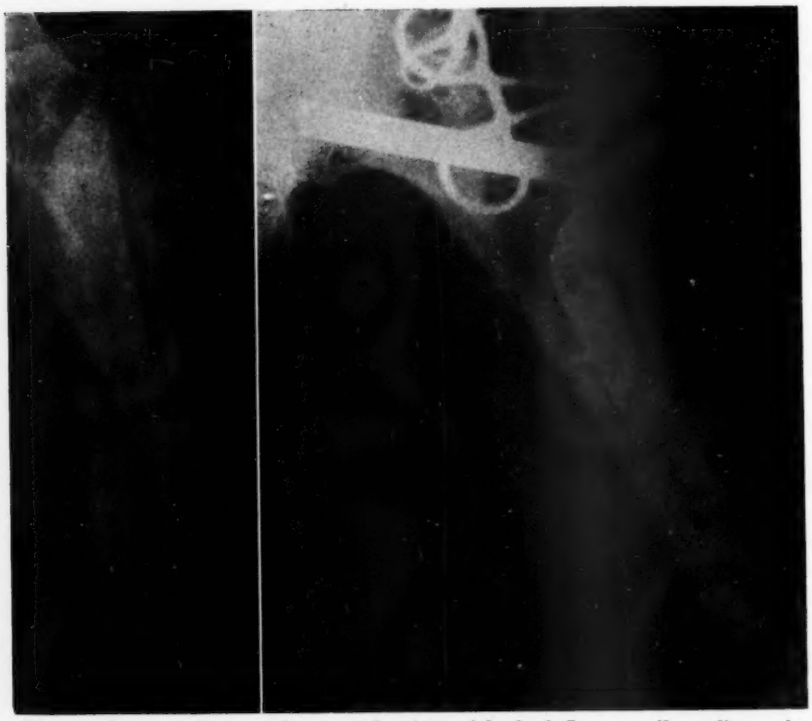


FIG. 4. Case IV. Pre- and post-reduction with dual flange nail appliance in place; eleven screws were used.

ture through the upper end of the femur. Four days postoperatively she was up in a wheelchair and felt fine. (Fig. 4.)

Three more patients have been so treated and the follow-ups on all seven of these cases, with the exception of one patient who died two weeks postoperatively, have been excellent.

SUMMARY

A new method has been presented for the treatment of the upper femoral shaft and subtrochanteric fractures of the femur. This is a preliminary report, but to date this method offers great promise and is not a very difficult technical procedure. No plaster cast or immobilization is necessary, and only in a few instances will a week or two in Buck's extension be advisable.

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EXPERIENCES WITH POSTOPERATIVE TEMPERATURES ABOVE 108°F.*

USE OF HYPERTONIC GLUCOSES

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THE occurrence of exceptionally high temperature in the surgical patient is of sufficient frequency to warrant a review of our own reactions to the problem and its management. In such instances death ensues mainly as a direct result of fever and not the underlying pathologic condition. That patients can survive temperatures over 108°F. with full recovery has been shown repeatedly.[1–5] Experimental work shows that living tissue does not become irreversibly damaged until the temperature reaches 115°F.[6]

It is the purpose of this paper to point out that if we can tide these patients over the temperature crisis, they will have more time to combat their diseases and a certain number would survive who will otherwise be lost. A review of the physiologic changes and a logical plan of treatment is therefore presented.

The general picture in extreme hyperpyrexia is one of marked metabolic alteration. The basal metabolic rate is often +50 to +75 in severe cases. Such a sudden increase in metabolism puts a severe strain on the resources of the body which, as we shall see, are already overtaxed.[7–9] Thus oxygen is in great demand but is supplied with difficulty, for it has been shown that the oxygen tension of arterial blood is materially reduced in cases of high fever.[10,11]

The pulse rate is increased from five to ten beats per minute for each degree rise in temperature (Fahrenheit). Later it becomes so rapid that insufficient cardiac output occurs. The blood pressure first rises and later falls to shock levels, indicating inability to cope with the situation. The blood volume is progressively diminished due to loss of water by the skin and lungs, and later by the advent of shock.[12–14] The blood becomes concentrated. When tissue fluid loss into the bloodstream exceeds 5 cc. per kg. per hour, peripheral collapse ensues. Progressive dehydration together with the high metabolic rate then increases the body temperature even more, constituting a deadly cycle.

As fever increases, the ganglion cells of the central nervous system shrink,[15] total chlorides fall,[16] the CO_2 content of the blood is lowered, the lactic acid content of the blood is increased by 50 to 78 per cent above normal,[17] base is mobilized from the tissues to the blood, the blood sugar rises early then falls as supplies become depleted and the non-protein nitrogen rises. The inorganic phosphorus falls due to the greatly increased rate of glucose utilization. The early rise in blood sugar is dependent upon the liver which is so stimulated in high fever to release sugar that it often overshoots its mark. Hypersecretion of insulin and epinephrine occurs.[18] These changes favor glycogenolysis to meet the demand for fuel, until the liver is depleted of its glycogen and disaster is at hand. Autopsy at this time reveals a marked decrease in liver glycogen.

In addition liver function becomes deficient as a result of hyperpyrexia *per se*.[19–22] This is unfortunate inasmuch as the demands made upon the liver at this time demand a very efficient response. Thus jaundice, hepatomegaly and liver failure have been noted following therapeutic hyperpyrexia.[19–21] The serum albumin and fibrinogen levels fall, again due to impaired liver function.

As a result of insufficient available glucose, proteins and fats are burned with remarkable rapidity to supply fuel.[23–27] Thus incomplete fat combustion occurs and ketonuria is observed. Protein metabolism is so altered that more than 25 gm. may be burned per hour. Glucose may thus be considered as a protein and fat sparer.

While these changes are taking place, the cardiopulmonary circuit is laboring desper-

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ately to keep up with the vast tissue demand for oxygen. Death finally ensues due to failure to supply the colossal demands for oxygen, fuel and water, together with the profound changes in blood chemistry and blood volume.

To offset these numerous rapidly progressive and complex changes is not an easy problem. In an analysis of the outstanding causes of death, however, certain points stand out and can be approached intelligently. These points have been emphasized. The author believes that a twofold plan of therapy should be followed. The first factor is the problem of reducing the fever; the second and most generally neglected is concerned with keeping the patient alive until the temperature can be reduced.

In regard to the first problem, the usual measures taken are generally considered to be adequate; however, certain refinements have been employed at Saint John's Episcopal Hospital which are not original. Since the chief mechanism of heat dissipation is the evaporation of water from the body surface, it is logical to augment this function as much as possible. Therapy is begun immediately. The patient is stripped and made to lie on rubber sheets. All windows are opened and a battery of electric fans is aimed at the patient. He is then sponged from head to foot with alcohol and ether. It must be remembered that the practice of laying alcohol-soaked towels on the patient inhibits effective evaporation and is therefore unwise. As soon as evaporation occurs in any area, it is responged so that neither time nor space are wasted. Ice is used in the groin, axillas and neck to afford physical cooling to the underlying great vessels. Treatment is continued vigorously until the temperature reaches 102°F. Thereafter no positive effort is made to reduce fever since these patients stand sudden changes in temperature poorly and the change may be irreversible.

The second division of treatment is carried out simultaneously. This consists of nasal oxygen and the administration of water and salt as isotonic saline, the amount and rate depending upon the individual case. Repeated examinations for the onset of pulmonary edema and estimations of the hematocrit, urinary output and urinary chlorides are an integral part of the treatment.

In addition the author has been using continuous infusions of 50 per cent glucose in distilled water for the duration of the temperature crisis to supply large amounts of glucose as quickly as possible for the reasons that have been enumerated. It is not believed that mildly hypertonic solutions of glucose are nearly adequate. Likewise, repeated intravenous administrations of 50 per cent glucose are not very satisfactory since much of the sugar injected will be excreted by the kidneys without being used, the dehydrating effect may be formidable and the supply of glucose is not maintained between injections. With continuous infusions, on the other hand, the dehydrating effect is minimal, the supply is constant and the percentage of utilization is great. If it is given as rapidly as possible by infusion, the rate of utilization just about parallels the rate of administration, as judged by the urinary wastage and the remarkable improvement in blood chemistry.

The use of hypertonic glucose is not new.[28,29] However, the use of continuous infusions of 50 per cent glucose has not been described previously. The author believes that this is an indispensable part of the treatment and accounts in large measure for the successes reported.

The following case reports represent the three highest temperatures seen on the Surgical Service during the last three years at Saint John's Episcopal Hospital. Several other cases of patients with temperatures of over 106°F. who were treated with success will not be reported herein.

CASE REPORTS

CASE 1. M. B. (No. T-1050), a forty-four year old colored female, was admitted with diffuse thyroid enlargement. She complained of moderate irritability, nervousness and exophthalmus, and had lost a slight amount of weight. Blood, urinalysis, temperature and respirations were normal. A slight tremor and a pulse of 102 were found. The basal metabolic rate was +44. Lugol's solution was administered for two weeks and the symptoms abated. A bilateral subtotal thyroidectomy was then performed and the patient did well for twenty-four hours. The temperature then rose from 100.6° to 105°F. by rectum and the pulse was 200. An infusion of 10 per cent glucose in water with 30 gr. of sodium iodide was begun

and the patient put into an oxygen tent. At the end of one hour the temperature was not recordable, being over 100°F. This was rechecked by using a second thermometer. The blood pressure was 220 over 100. The pulse was 160. The patient was comatose. The prescribed treatment was immediately instituted including infusion of 600 cc. of 50 per cent glucose. The temperature remained unrecordable for one hour then suddenly dropped to 107°F. After three hours it was 103.8°F. and at four hours it was 100°F. The patient was discharged on the eleventh postoperative day in excellent condition and has remained well.

CASE II. I. C. (No. U-1817), a twenty-two year old colored girl, was admitted with symptoms and signs of acute appendicitis. At operation a ruptured appendix with considerable localized peritonitis was found. The cecum was gangrenous and was inadvertently perforated. The appendix was removed and the stump tied, but the opening in the cecum could not be closed due to the changes in the cecal wall. A mushroom catheter was therefore placed into the cecum and anchored with a purse-string suture (which was soon to be regretted), a drain was inserted into the area and the wound was closed. Despite the administration of penicillin and streptomycin the patient did poorly for four days and generalized peritonitis was suspected. Accordingly, reoperation was performed and generalized purulent peritonitis was found, attributed to a leak at the site of the cecal opening which had been closed about the mushroom catheter. The terminal ileum and cecum were exteriorized and the abdomen closed. Four hours later the temperature was not recordable, being over 110°F. Pulse and blood pressure were not recordable. The patient was comatose. The prescribed treatment was begun including the infusion of 250 cc. of 50 per cent glucose. After thirty minutes the temperature was 109.6°F. by rectum. After one hour it was 106.8°F. and after four hours it was 99°F. A stormy postoperative course ensued necessitating several reoperations for drainage and colostomy closure, but the temperature never reached 105°F. The patient was discharged on the one hundred and seventh hospital day in good condition. When seen a year later she had remained well.

This case proves the point that given a chance to survive the temperature crisis the patient will have more time to fight the underlying disease and might even conquer such a catastrophy as generalized peritonitis.

CASE III. W. W. (No. U-2097), a thirty-one year old male, was admitted with signs of acute appendicitis. A retrocecal, infected appendix was removed and the stump tied. Postoperatively the patient did poorly, with abdominal distention and rise in temperature, pulse and respirations. Despite antibiotics and Wangensteen suction the course was downhill. On the fifth postoperative day the temperature reached 108.6°F. The pulse was not obtainable. The prescribed treatment was begun immediately including the use of 650 cc. of 50 per cent glucose. After forty minutes the temperature was 104°F. and after four hours it was 100°F. The patient seemed better, responded well and had a strong, regular pulse. The following day the temperature went to 104°F. The patient became comatose, the pulse imperceptible and the patient expired. Autopsy showed generalized peritonitis and an anaerobic infection of the anterolateral wall extending to the region of the cecum which was, however, intact.

Although the patient died, it is probably fair to say that the temperature crisis was met successfully and the patient was given an extra day with which to combat his infection.

SUMMARY AND CONCLUSIONS

1. A certain number of patients die of hyperpyrexia who might live to conquer the causative diseases if they could survive the temperature crisis.

2. It is believed that this number is greater than might be suspected.

3. The physiochemical changes occurring in extreme hyperpyrexia are reviewed and a regimen for treatment is suggested.

4. It is believed that a continuous infusion of 50 per cent glucose is an indispensable part of the treatment.

5. Case reports are submitted for evaluation of treatment prescribed.

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CARCINOMA OF THE BREAST

REVIEW OF 206 CASES

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IN view of the already massive literature on the subject of carcinoma of the breast any further discussion is in some measure repetitious. From our experience and from the reported experiences of other surgeons there is still a widespread lack of understanding of the salient points in the diagnosis and treatment of breast carcinoma. With this thought in mind the present review of 206 private cases of carcinoma of the breast is offered. Several observations are reported in illustration of some of the difficulties of diagnosis as well as some of the therapeutic and prognostic considerations involved.

Of the 206 patients comprising this study, sixty were examined before January 1, 1933, and 146 were examined from that date to January 1, 1947. Their ages ranged from twenty-six to eighty-four years. Thirty-six or approximately 17.5 per cent were under forty years of age, and eighteen or 8.7 per cent were over sixty-five. Thus 152 or 73.8 per cent were between these two ages.

The known duration of a tumor was from one day to twenty-five years. On the whole the period was considerably shorter in the patients seen in the earlier half of the period of this review than in the later half. In the earlier half the average duration was eight and a half months; in the later half the average was one year and seven months. The longer average in the more recent period is partially influenced by the fact that a few patients had had a breast tumor for ten to twenty-five years. Because of an apparent relation to the end results the known duration of a tumor in the two groups is of some significance as will be shown later.

Diagnostic Considerations and Criteria for Operation. The classical picture of advanced carcinoma of the breast is familiar to every physician. There are, however, occasions when the most seasoned clinician or surgeon is unable to distinguish early carcinoma from a benign lesion from the clinical signs alone. In the first place we are accustomed to the idea that carcinoma of the breast is without symptoms until late in the course of the disease. This is one of the fallacies of our teaching. If every patient who sought examination on account of a lump in the breast were questioned as to a previous discomfort or pain, it is probable that at least one-third would recall having experienced one of these two symptoms before their discovery of a tumor. Of the 206 patients in this series, sixty-two (30 per cent) reported pain in the breast. In addition several described a burning sensation or a sense of discomfort in the breast, or pain in the arm on the involved side. That pain does not necessarily indicate advanced carcinoma but may be experienced in early growths is evidenced by the fact that twenty-one of the sixty-two patients in our group who reported pain had no metastases clinically or microscopically. One of the twenty-one is still living and well more than twenty-two years postoperatively; another lived seventeen years, another fifteen and four have lived ten, nine, seven and five years, respectively. This point is important in that early carcinoma may be mistaken for mastitis or some other benign lesion merely because the patient complains of pain, and any connection between pain in the arm and carcinoma of the breast may be overlooked altogether.

In the absence of external signs of carcinoma of the breast inspection will often suggest its presence. With the patient in the erect position an asymmetry of the breasts may be apparent, the affected breast being elevated and drawn slightly to the side upon which the tumor is located; or if the tumor is in or near the center, the breast may be slightly flatter in this area than on the normal side.

In palpating the breasts one should do so with the utmost gentleness; otherwise the tumor cells may be impelled into the lym-

phatics and thus to distant areas. Palpation should be done with the patient in both the erect and supine positions and should include the borders of the breast and the surrounding areas, especially the axillary region, as well as the breast proper. Occasionally a tumor is found at or near the submammary fold or as far laterally as the axilla.

Cancer usually presents itself to the palpating hand as a firm mass, not definitely circumscribed, often fixed to the skin and not infrequently to the underlying structures or to both. The point to be remembered here is that benign lesions may likewise appear more or less fixed and not well defined in outline. The clinical diagnosis may obviously be made with more certainty if the axillary glands are enlarged. We have observed fixation in 126 cases, in eighty-nine (70 per cent) of which metastases were found in the axilla on histologic study. Fixation to the chest was present in nineteen, being associated with metastases in fifteen.

A tumor without fixation and palpable glandular enlargement is more difficult to diagnose clinically. The majority of such tumors are benign although fifty-nine or approximately 29 per cent of the patients comprising this study had neither fixation nor palpable axillary glands. Transillumination may be helpful in the diagnosis of some of these lesions; for example, a simple cyst will usually be translucent whereas a malignancy will cast an opaque shadow.

In the presence of inversion of the nipple, discharge from the nipple, ulceration or an "orange peel" skin, also, one should be cautious in pronouncing a tumor of the breast malignant in that, not infrequently, benign lesions produce these same signs. Adair[1] has observed one or more of these signs in eleven other diseases of the breast. Bloody discharge from the nipple is generally associated with an intracanalicular papilloma. Nevertheless, this finding should always serve as a warning of potential malignancy.

We have not employed aspiration as a method of diagnosis, believing it is not only inadequate but may cause dissemination of the tumor cells. Moreover, a lump in the breast, whether benign or malignant, should be removed; otherwise, sooner or later it is likely to undergo malignant degeneration. The fact that a few of our patients had been aware of a tumor for ten to twenty-five years before signs of malignancy appeared supports this view.

The inference to be drawn from these observations is that a biopsy should be made of every tumor of the breast before any type of treatment is instituted. Moreover, one should be prepared to have the specimen examined immediately, as delay in performing a radical amputation for a malignant tumor following section impairs the patient's chances for cure increasingly with the passage of time.

Just what constitutes operability in carcinoma of the breast depends upon the findings and the judgment of the surgeon. We have consistently performed radical mastectomy for all patients with axillary metastases and for a few whose supraclavicular, subaxillary or subpectoral glands were involved provided no areas of metastasis were observed roentgenographically elsewhere in the body. Unless extensive, ulceration is no contraindication to radical resection. In our experience, however, only a limited number of ulcerative lesions have been amenable to radical operation; nor have we regarded fixation to the chest wall as an invariable deterrent to the radical procedure. In a considerable number of these cases the tumor may be rendered operable by preliminary x-ray therapy; this was true in twelve of our nineteen cases in which the growth was fixed to the underlying structures. One is occasionally gratified to find that a patient with a fixed lesion survives for a number of years after this treatment. One of our twelve patients with deep fixation of the tumor lived more than ten years, one lived over nine years, another more than four years, and still another is living and well over four years after operation.

Treatment. Surgical opinion has long ago accepted radical excision including the pectoral muscles and axillary glands as the treatment most likely to destroy the lesion and affect a cure. Any operation which does not include the axillary glands if at all feasible is inadequate. As a matter of fact the disease may be more active in the glands than in the breast itself. We have observed three patients who had no clinical and little pathologic evidence of malignancy in the breast yet had well developed carcinoma in the axilla.

If radical mastectomy is out of the question, x-ray therapy may often be followed with

simple mastectomy to advantage. Of material importance is the comfort of the patient and the psychic effect of being rid of the primary lesion. It is possible, also, that simple mastectomy may have a favorable influence upon the ultimate outcome. Three of thirteen patients in our series who have undergone simple mastectomy following irradiation have lived from three to six years.

The choice of operation may occasionally depend upon the age and physical condition of the patient. For those of advanced age simple mastectomy might be preferable. Two of our patients, one eighty-four and the other seventy-eight years of age, had a simple amputation even though neither had clinical evidence of metastases and a radical operation could have been easily accomplished. The eighty-four year old patient survived more than three years after the operation. A simple mastectomy was performed for the patient aged seventy-eight because of serious associated disabilities. She could not be traced after one year.

One of the most controversial questions in the treatment of cancer of the breast concerns the value of x-ray therapy. Enlightened surgical opinion is not in favor of preoperative x-ray therapy because of its adverse effect upon wound healing, the damage to important tissues and an increased difficulty of the surgical performance. A number of authors, moreover, have found that the survival rate is unfavorably influenced by preoperative x-ray therapy. The five-year survival rate of Bainbridge's[2] patients who received preoperative x-ray was 11.53 per cent in contrast to a survival of five to thirty-six years for approximately 33 per cent of patients who had radical surgery alone. It has been our practice to employ x-ray therapy preoperatively only for certain growths fixed to the underlying breast structures, in the hope of making them amenable to radical mastectomy, and for ulcerative growths as a preliminary to simple amputation.

We give x-ray therapy following operation to patients who have demonstrable axillary metastases in the belief that the probable extension of life thereby gained well justifies the procedure. We have also given x-ray postoperatively to a few patients who had highly malignant lesions but no apparent metastases. Under such grave circumstances this treatment is employed largely on the principle that everything possible should be done to prolong the life of the patient. Whether or not it is actually beneficial is open to question.

Prognosis. The two factors of greatest prognostic influence in carcinoma of the breast are the extent of the lesion and the grade of the malignancy. Unfortunately, in a number of our earlier cases the grade of the malignancy was not recorded and we were unable to study the group from this viewpoint. Of these two factors, however, the extent of the lesion is more important in that once the axilla has been invaded by the malignancy the prognosis is far less favorable than if radical mastectomy is performed before the tumor metastasizes; this is true even though, in the former event, the growth is of low grade malignancy and, in the latter, of high malignancy. For example, a medullary growth which has not metastasized offers a much better prognosis than a scirrhous lesion which has already invaded the axilla when the patient comes to operation.

Another factor which may be of some significance is the age of the patient; the younger the patient, the less promising may be the prospect for cure. On this point, however, experience varies. MacDonald[4] has found that patients between thirty and fifty years of age obtain the best results from treatment.

It is agreed that pregnancy and lactation darken the outlook for the patient with carcinoma of the breast. Statistics show that these patients rarely live as long as five years. In view of this fact there is considerable controversy as to the advisability of castration of patients with cancer of the breast. Many surgeons advocate either surgical or irradiation castration as a precautionary measure in connection with radical mastectomy.

Also of some value in estimating the prognosis is the location of the tumor. Those situated in the inner quadrants are less favorable since metastasis is more likely to take place directly into the mediastinum and lungs. The prospect may be brighter if the tumor is in the upper outer quadrant; here the metastasis is usually into the axilla and one may thus be more successful in removing all the diseased tissue. Fortunately the upper outer quadrant is the most common site of the tumor.

In estimating the prognosis according to their extent carcinomas of the breast may be divided into three groups: (1) those limited to the breast, (2) those involving the axillary glands and (3) those which have metastasized

to other glands, tissues or organs. This grouping is based upon microscopic findings, of course, and not upon clinical signs alone. It is well known that glandular enlargement itself is by no means an infallible sign of metastasis. Sixty-one (30 per cent) of our patients had palpable glands, yet microscopic evidence of metastasis was found in only thirteen or 21 per cent of these. On the other hand, failure to palpate glands does not necessarily mean that the growth has not metastasized. Of our 206 patients, 145 (70 per cent) had no palpable glands yet 112 (77 per cent) of the 145 had metastases. These figures illustrate the unreliability of estimates of axillary metastases based upon the presence or absence of palpable glands. On the contrary, they bring out forcibly the necessity for radical amputation and microscopic study of enlarged glands in every case. If the choice between conservative and radical treatment were based solely upon the clinical finding of enlarged glands, surgeons would probably err in the treatment in at least 50 per cent of the cases.

One hundred twenty-five or 60.7 per cent of the 206 patients comprising this review had definite metastases and eighty-one or 39.3 per cent had none, as shown by histologic study. Of the 125, 116 had a radical mastectomy while of the eighty-one, seventy-two were treated in this manner.

Nine patients with metastases had irradiation therapy with or without simple mammectomy. Of the nine without metastases, two were the elderly patients previously mentioned who had only a simple amputation. The other seven had advanced ulcerative growths which were treated only with irradiation.

Of the 116 and 72 patients who had a radical operation, three and four, respectively, could not be traced. This leaves 113 with metastases and sixty-eight without metastases, a total of 181, who had a radical mastectomy and are available for study. Of these 181, 115 were treated three or more years ago. Seventy-eight (68.5 per cent) of the 115 had metastases while thirty-seven (32.5 per cent) had none. Seventy-six (66 per cent) have survived for three or more years. (Table I.)

The fourteen patients under forty years of age represent 18.4 per cent of the seventy-six while the sixty-two over forty years of age represent 81.6 per cent. These figures show a survival advantage of 16 per cent in favor of patients over forty without metastases as compared to those under forty, although a mere 3 per cent difference in the survival rates of the two groups with metastases. In both age groups a larger number of patients who had no metastases lived ten years or more.

TABLE I

CLASSIFICATION OF SEVENTY-SIX PATIENTS WITH CARCINOMA OF THE BREAST ACCORDING TO AGE GROUPS, INCIDENCE OF METASTASES AND PERIODS OF SURVIVAL

		3 yr.	5 yr.	10 yr.	15 yr.	20 yr.	25 yr.	Total
Patients under 40								
Without metastases..	(8)	2	0	2	0	0	1	5 (60%)
With metastases.....	(15)	5	4	0	0	0	0	9 (60%)
	23	7	4	2	0	0	1	14
Patients over 40								
Without metastases..	(29)	6	8	4	3	1	0	22 (76%)
With metastases.....	(63)	19	17	2	1	0	1	40 (63%)
	82	25	25	6	4	1	1	62

By combining the two groups one obtains a better picture of the survivals. (Table II.)

It will be observed that only four (8 per cent) of the forty-nine patients with metastases lived as long as ten years while eleven (40 per cent) of the twenty-seven without metastases lived ten years or more and almost one-half this number survived fifteen to twenty-five years. Ninety-two of the 115 patients were operated upon five or more years ago. Of these

TABLE II

SURVIVALS OF SEVENTY-SIX PATIENTS WITH CARCINOMA OF THE BREAST WITH AND WITHOUT METASTASES

		3 yr.	5 yr.	10 yr.	15 yr.	20 yr.	25 yr.	Total
Without metastases....	(37)	8	8	6	3	1	1	27 (70%)
With metastases.....	(78)	24	21	2	1	0	1	49 (60%)
	115	32	29	8	4	1	2	76

ninety-two, sixty-one (66 per cent) had metastases while thirty-one (33 per cent) had none. Forty-four (48 per cent) of the ninety-two have survived for five years or more. Twenty-five (57 per cent) of the forty-four had metastases whereas nineteen (43 per cent) had none. Of the twenty-five with metastases, only four (6.6 per cent) lived as long as ten years whereas of the nineteen operated upon before metastases had taken place eleven (58 per cent) survived ten years or more.

These figures are small but representative. Harrington[3] from a study of a large series of cases made similar observations. Others, also, have reported a comparable experience. The observation is significant in that it shows the progressively increasing survival rate of patients without axillary metastases in contrast to a rapidly decreasing survival rate after five years of those with metastases.

TABLE III
INCIDENCE OF METASTASES IN SIXTY PATIENTS WITH CARCINOMA OF THE BREAST

	With Metastases	Without Metastases	Total
Patients treated before January 1, 1933	33 (55%)	27 (45%)	60
Patients treated since January 1, 1933	92 (63%)	54 (37%)	146
Total	125	81	206

A comparative study has likewise been made between patients treated early in our experience and those treated within more recent years. The dividing point has been placed at January 1, 1933, which is approximately one-half the entire period. The results are shown in Table III. These figures are a sad commentary upon our success in reaching these patients before metastases take place. Whereas formerly 45 per cent had no metastases, in the later group 37 per cent had none. This finding no doubt has some relation to the fact that the average duration of symptoms was longer in patients of the later than in those of the first group, as mentioned earlier. We find some small comfort, however, in the fact that a slight improvement in the number without metastases has been observed since January 1, 1941. Of 105 patients who have come to operation during this period, sixty (57 per cent) had metastases while forty-five (43 per cent) had none.

So varied and so numerous are the questions to be considered in any study of carcinoma of the breast that when all is said and done we can only generalize in our conclusions. However, one fact always remains: A lump in the breast should be removed and examined under the microscope immediately upon its discovery and, if malignant, a radical resection should be performed. Until research brings us a better solution of the problem, we shall do well to adhere rigidly to this method of treatment. In so doing we may at least expect to reach a larger number of patients before the malignancy has spread and thus to increase to a material degree the number of our late survivals.

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PARTIAL GASTRECTOMY FOR PEPTIC ULCER*

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FROM the time of activation as a Veterans Administration Facility on January 1, 1947, through February, 1949, 101 partial gastrectomies for peptic ulcer were done at Halloran Veterans Administration Hospital. There were seventy cases of duodenal ulcer, twenty-eight of gastric ulcer, one gastrojejunal ulcer and two gastrojejunocolic fistulas. The following is a summary of the pre- and postoperative studies on these patients together with a follow-up report.

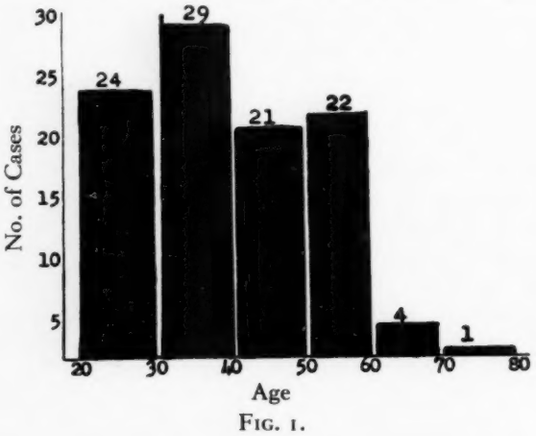

FIG. 1.

Preoperative studies revealed the 101 patients in this group were all male; three were colored, the remainder white. Their ages ranged from twenty-one to seventy-one, the duration of their symptoms from six months to thirty years. (Figs. 1 and 2.) Pain was a prominent symptom in all but one. Bleeding, vomiting and weight loss were also common complaints.

Physical examination was not remarkable except for epigastric tenderness and often evidence of some weight loss.

Fasting free hydrochloric acid ranged between 20 and 60 units in most cases although twenty-three had less than 10 units. After stimulation the free acid was usually 60 or higher. Histamine and alcohol were satisfactory stimulants, bread and water were not. Two cases had no hydrochloric acid after histamine; the highest value was 157. (Fig. 3.)

As shown in Table 1 x-rays were a satisfactory supplement to the history and physical examination. The primary radiologic impression was essentially correct in over 90 per cent of the cases. Localization of the lesion by this method was somewhat less accurate, being correct in about 85 per cent. Gastric lesions near the duodenum were the usual sources of error. No localization was attempted in cases of severe obstruction.

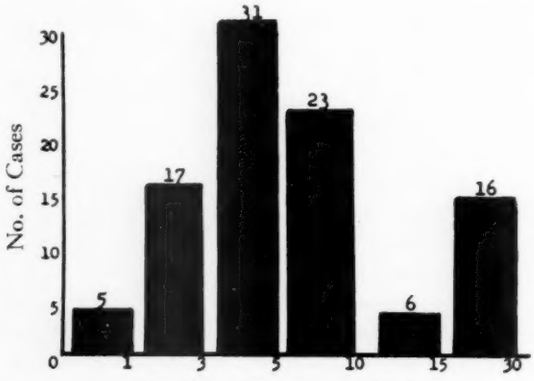

FIG. 2.

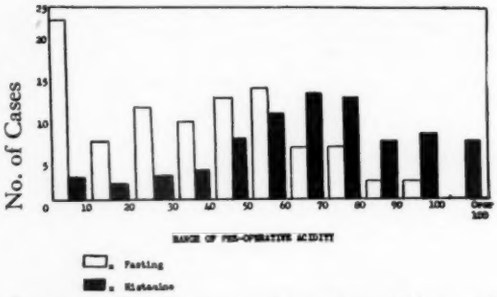

FIG. 3. Highest free acid values before and after histamine.

The factors which were of considerable weight in influencing the decision to operate

* From the Surgical Service of the Veterans Administration Hospital, Staten Island, N. Y. Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors.

were intractable pain seventy-eight, bleeding eighteen (recurrent fifteen, urgent three), obstruction twenty-three, possible carcinoma fourteen, repeated perforations one and gastrocolic fistula two.

TABLE 1

X-ray Impression		Operative or Pathologic Findings		
		Ulcer	Scarring or Edema	Indefinite
Ulcer crater	46	38	6	2
Spasm, deformity, ulcer presumed	40	21	17	2
Indefinite	3	1	1	1
Carcinoma	4	4	0	0
		Gastric	Duodenal	..
Gastric lesion	21	18	3	..
Duodenal lesion	66	10	56	..

OPERATIVE TECHNIC

In the usual case the abdomen was opened by means of a vertical incision; a majority of these were through the linea alba. Transverse incisions were used only four times. The proximal resection was made at what the operator presumed to be the junction of the proximal and middle thirds of the stomach; the distal resection was carried beyond the pylorus. All gastric and almost all anterior duodenal ulcers were resected. No special effort was made to resect the duodenum around penetrating posterior ulcers except in cases of active hemorrhage and where such resection was considered necessary for complete removal of the pylorus. The duodenal stump was closed with continuous catgut and inverted with one or two layers of fine silk. Nineteen cases were drained, usually because the security of the closure was in doubt. Open, two-layered, "isoperistaltic" anastomoses were done. They were grouped as follows: Hoffmeister sixty-five cases (anterior sixty, posterior five), Polya thirty-five cases (anterior thirty-two, posterior three), sleeve resection one case.

The wounds were sutured in layers using continuous catgut for the peritoneum and interrupted silk or wire for the fascia. Retention sutures were used in obese or malnourished patients and in those with chronic respiratory disease. The average operating time was between three and four hours.

POSTOPERATIVE COMPLICATIONS

There was one death in the 101 cases. It occurred seventy-five days after operation for acute hemorrhage in a twenty-six year old man. The duodenum had to be resected beyond the area of ulceration into the pancreas in order to control the hemorrhage. Subsequent closure of the stump was difficult and the area was drained. A low proximal resection was done because of the poor general condition of the patient. Death was preceded by signs of a duodenal fistula, abscess formation and gastrointestinal hemorrhage. At autopsy the duodenal stump was found to be incompletely closed, there was also a plastic peritonitis and a large anastomotic ulcer. Despite these findings this case is listed with some reservation since there was also carcinoma of the tail of the pancreas with massive metastatic involvement of the liver. (Fig. 4.) The liver had been biopsied at the time of operation and the presence of carcinomatosis was an influence in the conservative management of the complications.

In three of the remaining eighteen cases in which drainage was done prophylactically pancreatic or duodenal fistulas developed, but in all of them the drainage was transient and did not prolong the convalescence.

In one of the eighty-two cases in which drainage had not been done a duodenal fistula developed. The antrum had been excluded and the mucosa stripped. Signs of peritonitis appeared on the third postoperative day. Emergency laparotomy was done and a drain inserted into the area of the stump. Subsequently there was profuse drainage of bile along the tract. Still later a right subphrenic abscess developed and was drained intercostally. Thereafter the patient made a good recovery.

In one case a peritoneal abscess formed and after drainage a jejunal fistula. This patient is still in the hospital with suppurative chondritis of the ribs nine months after operation. The fistula has been closed.

A fourth case required reoperation for repair of a wound disruption.

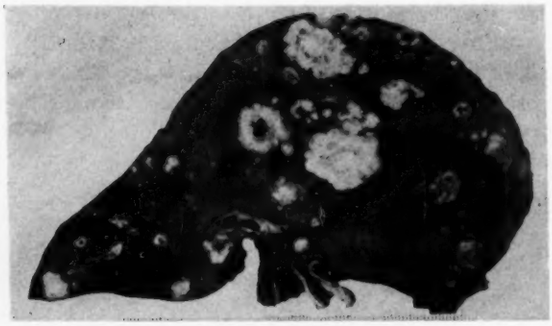

FIG. 4. Liver of case listed as operative mortality.

Vomiting was the commonest postoperative complaint. It was considered serious enough to be reportable if it occurred more than one time a week or more after surgery. Two reasonably distinct syndromes were apparent among the sixteen cases so listed.

In seven of the cases the onset of vomiting was insidious, the vomitus was small in amount and consisted of clear fluid or bile. None of these cases showed delayed emptying by x-ray and all but one had small gastric remnants. Vomiting in six of these cases with high resection, often accompanied with weakness and dizziness, persisted for at least several months into the convalescent period.

In nine other cases the onset of symptoms was sudden, with emesis of large quantities of food and fluid. X-rays showed delayed emptying in all cases, in several there was a considerable twenty-four-hour retention. In this group the gastric remnant was comparatively large or dilated. Clinical improvement was usually rapid and was accompanied with a corresponding improvement in the x-ray picture. At least two cases showed an area of incomplete obstruction in the distal loop; two others had an unusually short afferent loop which filled before the efferent. The serum proteins were studied in six of these cases. In none of them did the albumin fraction reach the so-called "edema level." The lowest total protein was 5.6 gm. per cent with an albumin of 4.2.

In contrast to the first group which had no evidence of obstruction, symptoms in the second group were apparently the result of a mechanical block. Edema of the stoma may be a factor in some of these cases. In our group it was not associated with a recognized hypoproteinemia. Other factors are distortion of the gastroenterostomy, kinking or spasm of the efferent loop and adhesions involving the more distal small intestine, especially in the region of the operative incision. In all of our cases the symptoms subsided without reoperation.

FIG. 5. Barium enema in case of gastrocolic fistula.

Other postoperative complications included atelectasis and pneumonitis (four cases), post-transfusion hepatitis (three cases), gastrointestinal hemorrhage (two cases), wound infection (two cases), superficial wound separation (one case) and thrombophlebitis (one case). In all, thirty-six complications occurred in thirty-three of the 101 patients.

GASTROJEJUNOCOLIC FISTULA

There were two cases in this group. One had had three previous gastroenterostomies for perforated marginal ulcer. The fistula was so large that barium given by rectum promptly appeared in the esophagus. (Fig. 5.) In both cases a one-stage operation was done with dissolution of the fistula by sharp dissection, partial gastrectomy, resection and anastomosis of the involved jejunum, closure of the colon and gastroenterostomy distal to the jejunojejunostomy. The postoperative courses were uneventful.

LABORATORY STUDIES

Laboratory studies revealed that in every case the limits of the distal resection were determined by microscopic section. Pylorectomy was assumed to have been complete because of the presence of duodenal glands in eighty-five of the 101 cases. In most of the remaining cases the operator had presumed that resection had been done beyond the pylorus but histologic confirmation was lacking. This error is of some interest inasmuch as x-ray incorrectly localized the lesion in a corresponding number of cases. Since vagotomy has become popular in some clinics in the treatment of duodenal ulcer and since most authors believe gastrectomy is the treatment of choice for gastric ulcer, it is worth noting that the average surgeon and radiologist do not always find it easy to differentiate a pyloric from a duodenal ulcer. This is especially true when the inflammatory reaction is marked.

The postoperative acid values were studied in eighty-three cases. Although these values vary considerably, the following general conclusions seem warranted: (1) Almost all gastric ulcer cases and about 60 per cent of the duodenal ulcers had low postoperative acids (less than 20 units of free acid after histamine); (2) postoperative anacidity occurred most often in cases with low preoperative acids and least often in cases with high preoperative acids; (3) as a group gastric ulcer cases had lower acids both before and after surgery; (4) when the preoperative acid was high (over 60 units of free acid after histamine), resection of 60 per cent or more of the stomach was required to produce anacidity; (5) when the preoperative acid was low, anacidity could be produced in some cases by resection of less than 60 per cent of the stomach.

In our cases there was no significant difference between the Hoffmeister and Polya anastomoses. It so happened that the majority of cases with incomplete pylorectomy appeared in the low acid groups postoperatively. The detailed data on which these conclusions are based are presented in another paper.*

Barium studies in a small group of cases did not show any remarkable differences in the physiologic activity of the Hoffmeister and Polya anastomoses. The proximal jejunal loop filled about as often in one type as in the other. The stomach emptied as rapidly or more so in the Hoffmeister as in the Polya. (Table II.)

Assuming these observations to be representative, two explanations of them can be offered. The first is that one can often make the resection on the greater curvature side appreciably lower than on the lesser only by limiting the total resection to an undesirable extent. Secondly, the emptying time of the stomach may depend in good part not on the type of gastrojejunostomy but on the capacity of the smallest ostium in the anastomotic complex, namely the efferent jejunal loop.

TABLE II

Type of Anastomosis	Proximal Jejunal Loop		Emptying Time in Hours		
	Filled	Not Seen	0–2	2–3	Over 3
Polya	19	10	7	5	7
Hoffmeister	24	11	12	5	4

FOLLOW-UP

Seventy-one cases were done prior to October, 1948. Sixty-eight of these or 95 per cent have been seen in the follow-up clinic. All but one of the cases done in 1947 have been followed for nine months or longer. One case, a severe morphine addict before and after operation for obstruction, was not rated. Results in the other cases were judged as follows: good forty-five cases, 67 per cent, fair thirteen cases, 20 per cent and poor nine cases, 14 per cent. (Table III.)

TABLE III
RESULTS

	Good	Fair	Poor
Gastric lesion	15	4	3
Duodenal lesion	28	7	3
Pathologic disorder indefinite	1	2	3
Ulcer resected (includes 15 gastric)	27	7	5
Ulcer not resected	16	4	1
Pylorectomy complete	37	9	8
Pylorectomy incomplete	6	4	1
Polya	15	7	2
Hoffmeister	28	6	7

* Annals of Surgery, March, 1950.

Most of the patients listed as having fair results were relieved of pain but complained of fullness, regurgitation, weakness or dizziness of such degree that they were considerably handicapped. The type of anastomosis did not seem to affect the result nor did the presence of a moderate amount of acid. To date we have found no significant effect from incomplete pylorectomy or from failure to resect the ulcer. In general patients in whom the pathologic findings were indefinite did poorly. It is impossible to say whether or not any of these patients exaggerated their complaints in order to increase their eligibility for disability compensation.

The nine poor results are listed later in some detail. Three cases are included because postoperatively tuberculosis developed in them which was not apparent on preoperative x-rays even on review. These cases are included with some reservation since no definite causal relationship with the gastrectomies can be shown. However, the histories suggest at least a low resistance to the progress of the disease. A fourth patient has been told that he has a spot on his lung. He is a morphine addict and his general hygiene is so very poor that it seemed impossible properly to evaluate his condition.

POOR RESULTS

The first patient, G. C., had a partial gastrectomy on May 6, 1947, for pain and recurrent bleeding. Preoperatively the free hydrochloric acid was 120 units; the x-ray findings were inconclusive. At operation the only pathologic finding was a moderate thickening of the pylorus. Microscopic sections were reported as showing normal stomach; duodenal glands were not seen. Shortly after operation pain, nausea and vomiting developed in the patient which still persisted eighteen months later. Current x-rays show that a fairly low resection was done; no ulcer is present. The fasting free acid was 0 but rose to 84 units after injection of ½ cc. of histamine. Blood sugar levels after ingestion of 100 gm. of glucose were reported as follows: Fasting 80 mg. per cent, one-half hour 123, one hour sixty-six, two hours seventy-two and three hours seventy-seven.

The second patient, J. D., had had abdominal pain for thirty years. He had also had a previous cholecystectomy. X-rays were reported as showing a deformed and irritable duodenal bulb. At operation on July 21, 1947, many adhesions were found but no definite ulcer. The preoperative symptoms persisted unabated after eighteen months. A diagnosis of inadequate personality was made at another hospital. Repeated x-rays have shown no abnormal findings. Both histamine and alcohol failed to stimulate the secretion of free acid.

The third patient, J. D., suffered a gunshot wound of the abdomen seven years before admission. For the past four years and over he had had epigastric pain relieved by food or soda; there had been a recent hematemesis. X-rays showed a markedly deformed duodenal bulb and two small craters. At operation on July 21, 1947, many adhesions were found but no definite ulcer. He continues to complain of anorexia, pain and vomiting. He says that he has been unable to work since operation. Barium studies of the stomach show no pathologic disorder. There is no free acid after histamine.

The fourth patient, M. B., had had epigastric pain for five years. Two years before admission he had been operated upon for repair of a perforated ulcer. X-rays showed a duodenal ulcer which was found at operation and resected. After sixteen months the patient claims marked weakness and inability to hold any solid food. X-rays show some tenderness over the anatomosis but no ulcer. There is no free acid after histamine.

The fifth patient, S. B., complained of severe pain of eighteen months' duration. At operation on August 13, 1948, an active pyloric ulcer was found. Two thirds of the stomach were resected together with the pylorus and proximal duodenum. The patient continues to complain of severe pain, vomiting and bleeding. There has been no objective confirmation of these complaints. The patient is markedly psychoneurotic. He will not submit to x-ray or laboratory examination.

The sixth patient, J. M., had a high resection for gastric ulcer on July 28, 1948. One year later he was still in the hospital because of suppurative chondritis following a peritoneal abscess and jejunal fistula.

The seventh patient, D. D., age fifty-six, had a long history of ulcer which included repeated episodes of pain and two previous perforations. Preoperative chest x-ray was negative. A few days after operation was done

on June 23, 1947, the patient had a persistent cough. He died one year later of advanced pulmonary tuberculosis.

The eighth patient, F. M., age fifty-six, had an emergency gastrectomy for hemorrhage on December 20, 1947. X-ray of the chest

TABLE IV
GENERAL RESULTS

	Good	Fair	Poor	Total	Total (Per cent)
Below admission and average weight.....	9	8	4	21	37
Admission weight regained below average weight.....	17	4	3	24	42
At or above average weight.....	12	0	0	12	21

before operation showed no pathologic disorder. One month after discharge he was admitted to a psychiatric hospital because of psychosis with somatic disease, gastric ulcer. X-rays showed evidence of partial gastrectomy. The stoma functioned well. The patient died four and a half months postoperatively. His physicians ascribed his death to inanition and minimal pulmonary tuberculosis.

The ninth patient, G. B., age twenty-two, had a partial gastrectomy on December 23, 1947, because of recurrent pain and moderate bleeding of four years' duration. The preoperative chest x-rays were negative. Four to six weeks after operation the patient had a persistent cough. Two months later x-rays showed pulmonary tuberculosis which progressed to cavitation.

In addition to the symptoms listed before a considerable number of patients complained of inability to regain their normal weight and strength, especially during the first six to twelve months. Weight gains were more common among patients who also had good results in other respects. (Table IV.)

SUMMARY AND CONCLUSIONS

Partial gastrectomy for peptic ulcer is a relatively safe operation. It is usually effective in relieving pain, bleeding and vomiting of the retention type. It is, however, by no means an innocuous procedure. High resection is often required to restrict effectively the production of acid and presumably the tendency to recurrent ulceration. This is especially true in those cases which have high acids before operation. As a group patients with duodenal ulcer have higher acids than do those with gastric ulcer. High resection may play some part in the production of important postoperative symptoms including fullness after eating, regurgitation, weakness, weight loss and possibly diminished resistance to infection.

In this series failure to resect the entire pyloric segment or the ulcerated portion of the duodenum has not materially affected the results to date nor has great advantage been found in a particular type of anastomosis.

Vomiting was a common postoperative complication. In one group of patients the vomitus was small in amount and associated with a rapidly emptying stoma, usually also with a small gastric remnant. Symptoms in this group tended to be persistent. In a second group the vomitus was large in amount; emptying by x-ray was delayed. The blood protein values were above the edema level. Symptomatic improvement was usually rapid and coincided with improvement in the x-ray picture.

As a group those patients in whom little pathologic disorder was found or who were frankly neurotic did poorly. Very careful assessment of this group before operation may help to improve the results but there will always remain a certain number of mentally unstable patients who require operation for the relief of organic disease.

If an alternative procedure such as vagotomy is chosen, care should be taken lest a potentially malignant pyloric ulcer be mistaken for a duodenal ulcer.

Operations on actively bleeding duodenal ulcers are dangerous not only because of the hemorrhage but also because dissection of the duodenum may be hazardous and closure of the stump difficult. In these cases the surgeon does not have the option of excluding the ulcer.

One-stage gastrectomy with local jejunectomy and colorrhaphy were successful in two cases of gastrojejunocolic fistula.

CYSTADENOMA OF THE PANCREAS

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"THE pancreas, with its pathological problems, still remains recessed and to a large degree unnoticed behind the cloak of the stomach, lesser omentum and adnexal viscera." These are the words of Dr. Alexander Brunschwig. The reviewer finds not only a maze of conflicting histopathologic interpretations, differences of classification and meager and inconsistent descriptions but also disagreement as to what constitutes malignant tendency or change. Some authors in their pathologic descriptions have used such terms as cystadenoma, multilocular cysts, proliferative cysts and true pancreatic cysts either synonymously or interchangeably in discussing the same lesions.

Etiology. Christian Harms[35] in 1932 alludes to Priesel's[71] concept as to the genesis of these tumors stating that he attributes these growths to a retention of secretion with subsequent abnormal proliferations of the smaller ducts and pressure atrophy of the intervening acinar tissue. Hans Schmidt[85] attributes the origin to an accessory pancreas stating that the growth starts in a congenital anomaly; others have suggested displaced portions of the primitive urogenital fold, mesonephros and primordia of the alimentary canal. Priesel makes the additional statement that a number of authors believe cystadenoma arises in isolated, aberrant pancreatic tissue. Archibald[40] considers them true tumors arising by proliferation from parenchymal cells. Judd[41] states that they form like the cystadenoma of the thyroid or ovary and are papillary ingrowths. Carter and Slattery[18] conclude that those tumors with cells resembling pancreatic tissue originate from alimentary canal primordia whereas cystadenomas bearing no resemblance to pancreatic tissue probably arise from the misplaced genital cells of the urogenital fold or the mesonephros.

Trauma, which is a factor in the development of the hematic or pseudocyst, cannot be considered here. It has been disproven that inflammation plays any incipient role in the growth of the cystadenoma. To conclude, little is known of the etiology of this condition and its rarity of occurrence is a factor in limitation of any prolonged thorough research.

Classification. Mahorner and Mattson[52] after a careful study of 108 cases of cysts of the pancreas, twenty of which were necropsy studies, classified the cysts on an etiologic basis as follows: (1) cysts resulting from defective development (cysts among infants, cysts associated with polycystic disease of the kidney, dermoid cysts and inclusion cysts); (2) cysts resulting from trauma (pseudocysts, hematic cysts); (3) retention cysts; (4) neoplastic cysts (cystadenoma, cystadenocarcinoma, teratomatous cysts); and (5) cysts resulting from parasites.

Brunschwig[13] considers the cystadenoma as a lesion occupying a midway position between solid benign tumors and true cysts of the pancreas, but he further modified his position by saying, "This statement should not be construed to indicate that all solid benign epitheliomas (except islet tumors) become cysts and that cystadenomas represent a stage in this metamorphosis." Rabinovitch and Pines[75] also refer to cystadenomas as true pancreatic tumors arising from the parenchyma of the organ. The older authors[79] classified cysts of the pancreas as follows: (1) retention cysts, (2) proliferative cysts, (3) congenital cystic disease, (4) hydatid cysts and (5) pseudocysts.

Cystadenoma of the pancreas is markedly rare in occurrence, and we find a variance as to its reported incidence.

Pathology. Grossly, cystadenomas are rounded, neoplastic masses with a coarsely lobulated surface. They vary from the size of a cherry to tumors as large as a football.[73] They usually have a definite semi-translucent, fibrous-like, tense capsule. They exhibit a tense, hard, nodular consistency to palpation. Their gross appearance may be likened to a mass of glass marbles set in a dense, rubbery substance. Brunschwig likens them to a cluster of grapes. These locules or cyst spaces combine in a honeycomb and are numerous,

varying in size from microscopic to several centimeters in diameter.

On section the fresh surfaces appear coarsely porous, and as the cut cyst spaces empty, the surface takes on a sponge-like appearance. In some cases there may be one, two or more spaces, larger than the rest, of a relatively solid consistency. The cyst spaces are filled by clear, yellow, brownish or purplish fluid with a variable viscosity. The contents may be thin, clear, turbid, hemorrhagic, viscid, mucoid or gelatinous. The intervening fibrous stroma also varies in amount. There were nine cases reported in the literature in which the stroma contained depositions of calcium. Hyalinization may occur, causing the resemblance to corpus albicans of the ovary. Smooth muscle fibers may be present.[45,67,71,104] The tumors usually are well encapsulated and consequently grow by expansion although infrequently there is no encapsulation but only a thin line of demarcation. The capsule is coursed by large veins and arteries. Occasionally (and it is here that opinions among pathologists differ) the tumors seem to infiltrate the adnexal structures and surrounding pancreatic parenchyma. Beust (in Brunschwig[13]) reports an infiltration through the duodenal muscularis to the mucosa. Brunschwig also reports a case of a tumor mass measuring 7 cm. in diameter occupying the head of the pancreas and grossly infiltrating the wall of the duodenum. The common practice has been to classify such papillary cystadenomas of the pancreas as benign if there is a lack of direct microscopic evidence of malignancy. Dockerty (quoted by Benson and Gordon[5]) believes that in the presence of papillary projections, even though the microscopic criteria for malignancy are minimal, they should be classified as malignant. Sofrano[91] in 1906 reported a portal vein embedded in the cyst wall but with no infiltration of the vein wall by the tumor mass. This type of encroachment is unlike and apart from extension by infiltration. It is this characteristic of the cystadenoma of the pancreas, the ability to engulf with ameboid-like extension around adnexal organs and structures, to which this article wishes to call particular attention. This type of extension and growth is compatible with benignancy whereas the infiltrative type may be questioned by some pathologists as a stage of premalignancy although there is a lack of evidence of any metastases. Grossly, the cystadenoma does not attain the larger size of other pancreatic cysts. On section it is usually multilocular whereas the pseudocyst which is the most common among the pancreatic cysts is usually unilocular or bilocular.

Characteristically the cysts are lined by a single layer of epithelium. Occasionally there is a papillary-like piling up. The cells vary from low to tall, closely aligned, columnar epithelium. They may be cylindrical similar to those of the pancreatic ducts but infrequently are cuboidal or flattened. The increased tension of the fluid causes the flattening of the cells which may get so extreme as to cause a resemblance to lymphoid cells or endothelial cells. Diagnosis of lymphangioma, therefore, has been made in some instances in the past. E. W. Thurston, in examining the photographs on the case reported herein, called the author's attention to this fact because of certain sections that had lymphangioma-like or lymphosarcoma-like appearance. The cytoplasm of the cells is clear. Nuclei are basal in position, certain portions show single layer epithelium whereas other sections of the same specimen may show piled up epithelium in the papillary folds. It was Gruber's[35] contention that this indicated a malignant tendency. The stroma between the cyst walls is variable in thickness and usually contains a thin layer of loose connective tissue. However, in many instances hyalinization occurs in connective tissue septa. Occasionally smooth muscle fibers may be found. There were nine cases reported containing calcification in the stroma. Harms[35] was the first to note this characteristic of cystadenoma.

Histopathologic differentiation of cystadenoma, cystadenocarcinoma, and multilocular cysts of the pancreas becomes at times quite complex. Brunschwig and others call attention to this difficulty. Generally speaking, nevertheless, the cyst spaces of the multilocular cyst are larger and scarcer while in the cystadenoma they are smaller and multitudinous. After eliminating the malignant tumors and segregating them the present review discloses a residuum of fifty-six cases of benign cystadenoma. Benignancy, a criterion in the differentiation, was adhered to rigidly. Seven of these cases could not be differentiated from multilocular cyst and polycystic disease of the pancreas. These seven cases were therefore subtracted from the total of fifty-six cases

leaving a balance of forty-nine benign cystadenomas up to the present writing.

Symptoms and Findings. The fact that lesions were found incidentally at necropsy in patients who died from other causes and without any history of pancreatic disease indicates the insidiousness of the cystadenoma and deficiency of prodromas. Usually a palpable tumor mass in the epigastric region is the first recognizable sign of the lesion. These neoplasms may become large enough to be discovered inadvertently by the patient or by the examining physician during the routine course of examination. Very often it is asymptomatic and painless. The symptomatology usually is that of any variety of pancreatic cyst. Symptoms depend upon the involvement or encroachment, whether completely circumferentially or as an infringement, upon the lumen of the surrounding viscera due to pressure or engulfment of the growing tumor. The symptoms which are complained of are anorexia, epigastric discomfort, (and in the large tumors) premature satiation nausea, vomiting, belching and gaseous distention. Jaundice was encountered in three cases.[39,72,91] This was due to the fact that the cystadenoma involved the head of the pancreas adjacent to the common bile duct. Sharp, darting pains in the abdomen may occasionally be observed prior to discovery of the mass. Pain when it occurs will vary in intensity and location with the location of the cyst and the organs and structures impinged upon by the tumor. Pain may be referred to the back and it may occur anywhere in the abdomen although usually it is confined to the upper hypochondrium and most often in the left upper quadrant. Severity and quality of the pain varies from a distensive sensation or a dull, dyspeptic, regurgitant ache to a steady tugging sensation and even to a severe, shooting, cramp-like radiation. If the tumor lies in the body, neck or head and overlies the large vessels, a tremulous, thrill-like, regular throb which is synchronous with the pulse can be ascertained by palpation; if the patient is thin and the tumor protuberant, this can be observed visually. The nausea and vomiting, if present, together with the early satiation and chronic dyspeptic symptoms will of necessity be accompanied with a loss of weight and weakness due to interference with nutrition.

Mobility of the mass is dependent upon the degree of embedment in the pancreas and its location in the pancreas. Those in the body and tail may be quite mobile. Deep embedment in the pancreas causes limitation of movement. Adherence by fibrous attachment or through engulfment of other adjacent organs will also curtail movability.

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	No. of Cases	Per cent
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Thirty-three case reports listed the site of attachment of the tumor mass to pancreas; these assumed the distribution and arrangement found in Table 1.

In the literature several patients were cognizant of a tumor mass in the epigastrium for a long time before reporting to the surgeon. Some of these patients felt an intra-abdominal movement of the mass upon rotation of the body in the supine position. In those cases in which the cystadenoma was found in the head or neck of the pancreas and in the rarer event when attachment or encroachment upon the portal or other large vessels occurred, a distinct pulsation was complained of or could be elicited by palpatory traction on the mass. An additional unreported finding of this lesion is the ascites and transient ankle edema found in the author's case. This condition is a direct resultant of the extrahepatic portal bed block syndrome[21] produced by the partial occlusion and pinching off of the portal, superior mesenteric and splenic veins and inferior vena cava by the movement of the engulfing tumor mass present. This can be easily seen in the accompanying drawing of the tumor mass.

The diagnosis rests to a large extent on three important findings, namely, (1) presence of a palpable intra-abdominal tumor usually in upper left hypochondrium (occurred in forty-six of the fifty-six cases reviewed); (2) dyspeptic distress (occurred in forty-one of the fifty-six cases) and (3) pain, variable in character (occurred in thirty-two of the fifty-six cases). (Walters and Cleveland[100] report pain

in over 85 per cent of their 139 patients with pancreatic cysts.)

It may be mentioned that the laboratory offers little or no assistance and in the event there is an interference with external secretion, the then positive laboratory findings tend to lead the examiner further away from the correct conclusion. The extent of assistance by the laboratory chiefly lies in ruling out such other conditions as adenoma, carcinoma and pancreatic abscess. The islet adenoma patient would, of course, present Whipple's triad with a hypoglycemia below 50 mg. per cent. Blood amylase or lipase and blood sugar usually are found at normal levels. The resultant degree of malnutrition and loss of weight is hardly ever severe enough to affect albumin-globulin ratio or total protein levels. Blood, urine and stool analyses provide little if any specific aid in the diagnosis of pancreatic cyst or cystadenoma. Laboratory investigation is only important in negating and eliminating other pathologic disorders that must be considered tentatively in arriving at a final deduction of pancreatic cyst or benign tumor.

Roentgen Examination. In its growth the cystadenoma as a rule displaces either the stomach or colon. If the growth starts on the superior portion of the pancreas, it most probably will present in the lesser omental cavity pushing the stomach down and forward and causing a bulge through the gastrohepatic ligament. If the mass finds root in the inferior pancreatic border, the colon will probably be displaced and the tumor will be covered by the gastrocolic omentum. An extension through the layers of the transverse mesocolon or retroperitoneally is found infrequently. This is one lesion, as shown by a perusal of former literature, that taxes and exacts the full and cooperative use of all available diagnostic armamentarium at our disposal. The role that x-ray assumes in aiding the differentiation of cystadenoma of the pancreas from other tumor masses of the region depends solely upon the thoroughness and zealousness of the examining roentgenologist.

There are two main types of tumor distinguishable in the pancreas roentgenologically, namely, benign cysts and cancers. The cysts because of their usually large growth produce signs that are more pronounced than those of cancer of the pancreas. Since the benign cysts grow expansively and evenly in all directions, they will present smooth, rounded outlines which is in direct contrast to the irregular growth in variable directions of the malignant growths causing an irregular outline. Cystic tumors are usually movable while the cancerous tumors are usually fixed to adjacent structures producing angular, rigid contours. Some tumors can be recognized by distinct differences in the shadows they cast on the plain film: shadows similar to the kidney in contrast to the retroperitoneal fat. This abnormal shadow on the plain film may be the first evidence of a tumor in this vicinity. Ehrmann and Eisler, quoted by Borak, have emphasized its importance. Changes in the stomach and duodenum due to their close relationship to the pancreas occur as a direct result of three main types of encroachment, namely, displacement, compression and invasion.

Displacement. Tumors localized in the head of the pancreas, if large enough, produce the characteristic horseshoe widening of the duodenal curve. The antrum of the stomach is displaced forward. Tumors of the neck and isthmus of the pancreas cause an upward displacement of the stomach. Tumors of the body of the pancreas cause a forward or a downward displacement of the stomach. Tumors in the tail of the pancreas will displace the stomach to the right.[10]

Compression. Likewise, compression can cause pronounced derangements, especially that due to benign growth, such as incomplete obstruction, a constant filling defect of the duodenum, prolongation of evacuation time and distortions as the hourglass stomach. It may simulate filling defects which however can be differentiated by fluoroscopic observation during positional changes of the patient.

Invasion. This type of growth is most often seen in the malignant tumor and very rarely in the benign. Because x-ray is the only helpful examination that can be relied upon for any assistance in deriving our diagnosis, it should be stressed that the surgeon should insist on a most complete and thorough investigative effort on the part of the roentgenologist.

Evidence obtained from a review of the clinical history and the presence of a firm, rounded, upper abdominal mass, coupled with roentgenographic findings of pressure distortion upon neighboring organs, especially the stomach and colon, suggests usually pancreatic cyst or tumor. The other conditions

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that must be considered and differentiated are malignant tumors, retroperitoneal lymph nodes, retroperitoneal cysts, lipomas and mesenteric cysts, splenomegaly, cysts of the kidney and pyonephrotic kidney, aneurysms of abdominal aorta and hydrops of the gallbladder.

CASE REPORT

On October 2, 1946, the patient complained of feeling a lump in the stomach. She had been perfectly well up to her present illness except for occasional epigastric distress after eating fatty, fried foods. About August, 1946, she became conscious of a lump in the epigastrium. She stated she was conscious of an intermittent pulsation in this mass and that she felt rather certain that it was free and movable. Whenever she would turn in bed it moved about. Lately, she experienced a slight tug substernally on movement of the mass. Associated with this there was an obvious, rapid increase in size producing a visible swelling in the epigastrium. With movement it would roll into the left upper quadrant beneath the costal margin. She was able to bring the mass into the epigastrium at will merely by rotating her trunk. In the last two weeks the pulsating and throbbing feeling of the mass became quite pronounced. Concomitant with this increased size of the epigastric mass she noticed that she attained earlier satiation and in the past seven weeks had lost about 3½ pounds. There was a transient type of edema of both legs which would disappear when the patient was recumbent. There were no other symptoms. Upon further interrogation the patient stated the pulsation and throbbing were first noticed as far back as February, 1946. Her appetite was always good but the patient recently noticed an earlier sense of fullness and satiation. Selective dyspepsia had been noticed, however, to fat and fried foods which evoked a rather marked distention and belching. Nausea was slight, but vomiting never occurred. There had been transient edema of both ankles for the past seven to eight weeks which would disappear on lying down. Electrocardiogram studies were negative. A searching history with the thought of a possible traumatic cyst was taken with reference to any abdominal injury, but all information elicited was negative.

Physical examination revealed a well developed white, American-born female, about sixty-five years old, not acutely ill and free of pain. There was a mass filling the epigastrium, substernally, nodular and firm in consistency. This mass which approximated the size of a grapefruit was relatively fixed and pulsating. The thrill could be felt through the abdominal wall by placing the hand directly over the mass or by displacing the mass and retaining a stationary position with tension. Slight tenderness was elicited by movement of the tumor or by traction on it. The movement of the tumor from side to side due to rotation of patient while lying down caused no pain, only cognizance of the changing position by the patient. There was no other tenderness or rigidity.

From an x-ray examination all findings were negative except for a fairly large stone in the fundus of the gallbladder and a large palpable mass within the ring of the lesser curvature which is not movable and apparently did not arise from the stomach. The character of the mass was not determined. From the fluoroscopic examination we may infer that the mass may have its origin in the lesser omental cavity. There was a forward displacement of the pyloric end with a widening of the gastrovertebral interval.

In view of the aforementioned findings it was reasoned that the intra-abdominal mass was most probably of pancreatic origin. Mesenteric cyst, retroperitoneal tumor and gastric malignancy were also considered. Operative intervention was decided upon.

On October 29, 1946, a mid-epigastric paramedian incision was made. A large tumor mass presented itself through a thinly stretched hepatogastric omentum. The latter was split and the left gastric artery was sacrificed and ligated to allow for a sufficient aperture and access to the tumor. The presenting mass proved to be a multilocular cystadenoma, hard and non-compressible, and about the diameter of a large grapefruit. This filled the lesser omental cavity causing a displacement of the stomach anteriorly and inferiorly. Utilizing sharp and blunt gauze dissection the mass was mobilized down to a rather broad base, about 2½ inches to 3 inches in width. At this stage it was noticed that the splenic at its confluence with the superior mesenteric vein and also the adjacent portion of the portal vein were enmeshed in the substance of the lowermost portion of the cystadenoma. The

neck of the pancreas from which the tumor arose and the head of the pancreas were both compressed and to a degree dislodged by the mass. The exact origin of the tumor was at the posterosuperior surface of the neck of the pancreas.

It was decided to remove the uppermost two-thirds of the mass by a transverse section.

Figure 1 shows the tumor mass at this stage with the pertinent anatomic structures involved. The involved region is sketched with portions of the stomach, duodenum and pancreas removed to illustrate better the involvement of the splenic, superior mesenteric and portal vein and the superior mesenteric artery by the tumor. The drawing is self-explanatory otherwise.

The remainder was then slowly and carefully morcellated away from the involved blood vessels. The discovery that a blunt probe could readily loosen the blood vessel walls from the engulfing tumor mass was a grateful finding. At no point did we note any infiltration of vascular wall by the cystadenoma. The remaining remnant of the tumor attached to the posterosuperior border of the neck of the pancreas had a base about 1 inch in diameter which disengaged rather easily from the pancreatic substance. The site of attachment needed no suturing as no bleeding occurred. The spleen was enlarged moderately due to the encroachment of the splenic vein. The rent in the gastrohepatic omentum was approximated by catgut.

Cholecystostomy was subsequently performed and an olive-shaped stone was removed. Gallbladder was closed over a catheter. Two Penrose drains were inserted, one into the lesser omental cavity through the foramen of Winslow and one to Morrison's pouch. Both drains and catheter were carried exterior through stab wound in the lateral flank. The abdomen was closed with chromic (Finney) and three tension nylon sutures. Dermic graft was used on the skin.

The pathologic report was as follows: grossly, the specimen consisted of three pieces in aggregate measuring 14 by 13 by 7 cm. composed of a larger mass with bosselated surfaces attached to which were adipose tags. This larger mass was well encapsulated. The color was grey with darker brown areas. The surfaces made on cutting were spongy, cystic tissue, the cysts filled with clear grey liquid.

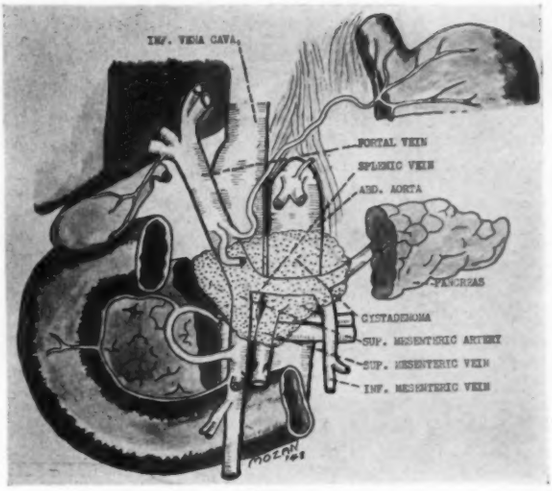
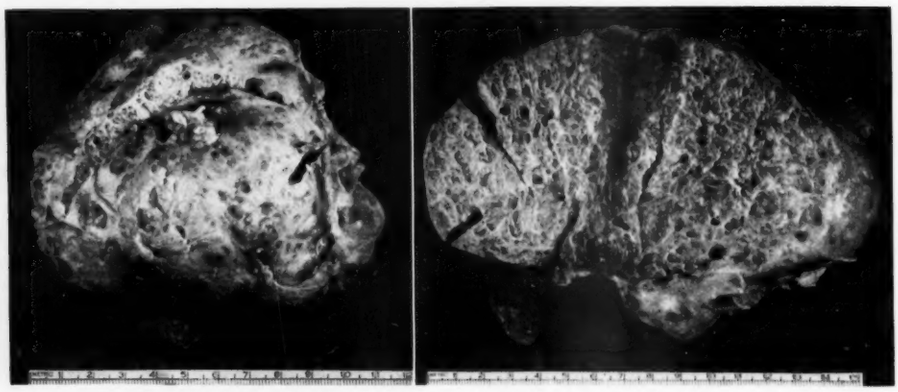


FIG. 1.

The small pieces resemble the larger but were more fibrous. An olive-shaped smooth calculus 25 mm. in length and diameter was present. (Figs. 2 and 3.)

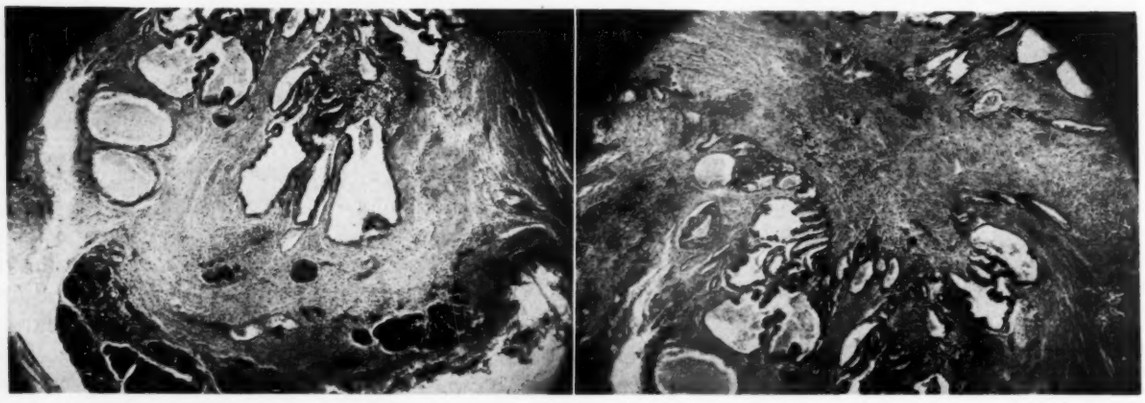
Microscopically, the hematoxylin-eosin stained sections of the formalin fixed tissue revealed a narrow rim of normal-appearing pancreatic tissue. The remainder consisted of a larger amount of connective tissue surrounding many cystic spaces both moderately large and small. These were lined with a low stratified, cuboidal epithelium in most instances and the lumina were empty or contained fresh-appearing erythrocytes and pink-staining material (secretion?). In addition to the simple cystic spaces there were others in which papillary projections were seen arising from the cyst linings. These were likewise covered with low stratified, small, cuboidal cells with clear cytoplasm. In the remaining connective tissue were many collections of round cells, many fresh-appearing erythrocytes, hemosiderin and occasional nerve fibers. Further close search revealed occasional small oval or round collections of cells with deeply staining nuclei and light granular cytoplasm. The significance of these was conjectural but the possibility that they were ectopic islets of Langerhans was considered. Three microphotographs are included showing certain interesting aspects of the micropathology. (Figs. 4, 5 and 6.)

The patient was gradually made ambulatory by the third postoperative day. Very little drainage was noticed on the dressings after the fifth day. The first Penrose drain was



2 3

FIG. 2. This presents the gross specimens directly after removal, cystadenoma and cholelith.
FIG. 3. This shows the sea-sponge appearance of the transected cystadenoma.



4 5

FIG. 4. Pancreatic glands with adjacent fibro-adenomatous tissue.
FIG. 5. Adenomatous area showing papillary character of growth. × 60.

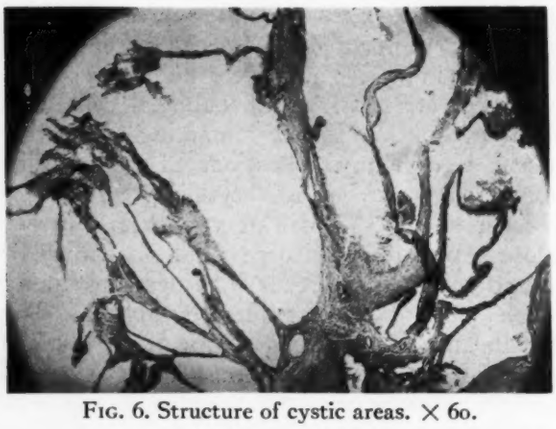


FIG. 6. Structure of cystic areas. × 60.

removed on the sixth day and the second on the eighth day. Removal of the gallbladder drain was effected on the eleventh day which was two days after the patient's discharge from the hospital. This illustrates the uneventful nature of the patient's recovery. The sinus tract left by the drains continued discharging a bile-stained fluid for nine more days before occluding completely.

Since convalescence the patient has been recalled for further clinical observation and has been followed up to the present time. She has gained 9 pounds, has no complaints and one year and six months postoperatively her general condition is excellent. The transient edema has not recurred since surgery. There is no evidence of recurring tumefaction anywhere intra-abdominally. Her dyspeptic symptoms have entirely subsided and she states she can now complete a meal without a feeling of overstuffing the stomach. The blood sugar, serum lipase and differential count are within normal limits.

SURGICAL CONSIDERATIONS

Yamauchi is foremost among the authors in stressing the importance of complete extirpa-

tion no matter what the offending tumefaction may be. Sound surgical judgment demands complete ablation of such lesions.

Drainage with or without partial excision was accomplished in sixteen cases. Of these there were five benign cystadenomas and one borderline lesion. One or more previous drainages had already been performed on eleven of these cases which included the five benign cystadenomas. Forty-two per cent of benign cystadenoma had been subjected to repeated drainage at the end of which procedure permanent cure was still doubtful since none of the cases showed follow-up beyond one or two years. Extirpations were generally accomplished in those instances in which the growth was small, when it possessed a narrow base or when the tumor was found arising from the tail. A few instances are recorded in which growths with broad bases or growths located in the head and other inaccessible portions of the pancreas were completely extirpated.

In a number of other cases the tumor was removed after much difficulty depending upon the necessity of ligating large vessels and removing dense, fibrous attachments. In six cases the pancreas had to be partially resected. In the management of the malignant tumors in the head of the pancreas Brunschwig has elaborated technics and had described them in comprehensive detail. One of the stages of his operation was suggested by Marogna[56] who demonstrated the feasibility of suturing the pancreas stump directly into the bowel as an outlet of pancreatic juice after resection of the head of the pancreas.

Acknowledgment of the vascular supply to the pancreas is important. Of the anomalies the one to cause most mischief if overlooked is the abnormal origin of the middle colic artery from the gastroduodenal.[10] The incidence of such an unusual origin is 8 per cent. An inadvertent or accidental ligation here would most certainly result in transverse colon necrosis.

Complete extirpation of certain broad-based cystadenomas and cysts, due to their location, was considered by many surgeons to be hazardous because of the involved risk to the patient. With each new surgical intervention and experience in this region, coupled with experimental physiologic work, a practical surgical technic has been evolved. Thus the hazard seems now to have been surmounted and this is very well illustrated in the comparative mortality statistics found in Table II. This review lists forty-nine cases of benign cystadenoma of which thirty-one cases were explicit as to the type of surgical intervention. Twenty-nine of the latter showed a postoperative follow-up in addition.

TABLE II
METHODS OF SURGICAL TREATMENT AND COMPARATIVE MORTALITY RATES

Type of Operation	Cases	Recovered	Died	Mortality (Per cent)
Abdominal exploratory only	2	0	2	100
Partial excision	4	1	..	.....
		3 Unrecorded	..	?
Exploratory and biopsy	3	0	3	100
Complete extirpation (Case herein included)	22	19	3	13.6

Progress in surgery of the pancreas is beset with many hindrances two of which are outstanding. First is the inability to prove the function, position and pathologic changes in the organ by any means at our disposal with any ease or assurance of correctness. The other is the inaccessibility and recession of the organ which make it prone to be disregarded by the surgeon in the performance of other abdominal surgery.

SUMMARY

1. A complete extirpation of a benign cystadenoma of the pancreas was reported and a series of fifty-six cases collected from the medical literature reviewed.

2. Attention is directed to a heretofore unlisted finding of transient edema found in this case.

3. Pathologically, cystadenoma of the pancreas is a multilocular, cystic, adenomatous and neoplastic tumor, benign in character.

4. In its growth and extension it encompasses surrounding structures and organs without infiltration thus allowing facile dissection. Extension with infiltration is a rarity; encapsulation is the rule.

5. Clinically, cystadenoma is characterized by an insidious slow growth. Later a palpable tumefaction develops and abdominal pain in the upper epigastrium, dyspeptic symptoms and weight loss.

6. Roentgen examination (utilizing lateral plate technic) has proved a most valuable adjunct in diagnosis.

7. Eight of the fifty-six cases had associated diabetes mellitus.

8. Ratio of occurrence in the sexes was seven females to one male.

9. Complete surgical extirpation is the method of choice in the opinion of most authorities and proffers lowest mortality (13.6 per cent).

10. A plea is made to the surgeon to keep in mind routine examination of the pancreas by palpation in the course of surgery of the region as in doing gallbladder, common bile duct, gastric and duodenal work. This procedure will afford him the opportunity to recognize the normal feel of the pancreas and thereby also insure the disclosure of a great amount of pathologic disorder that would otherwise remain hidden.

Acknowledgment: I wish to thank Dr. E. W. Thurston, our pathologist, for his whole-hearted cooperation in the study of tissues and slides of the case and for his help in interpreting the translated pathologic descriptions. I am also grateful to Drs. T. M. Larkowski, G. Apfelbach and N. Casciato for their assistance in translating the foreign articles.

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END RESULT STUDY OF McMURRAY OSTEOTOMY FOR ACUTE FRACTURES OF THE FEMORAL NECK*

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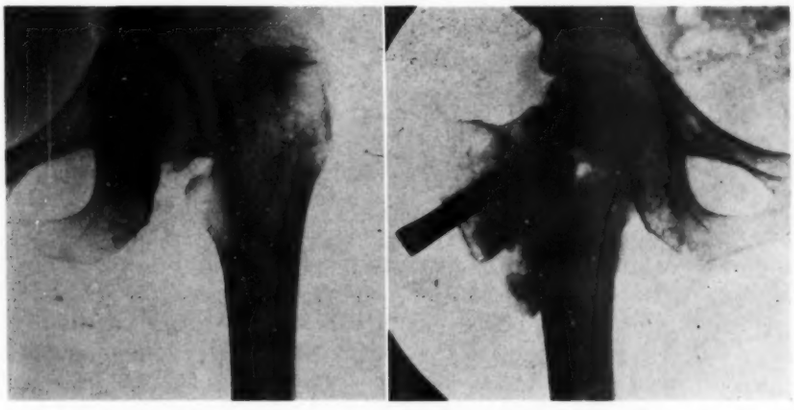
WE have studied our failures of union from internal fixation of fractures of the femoral neck for a possible cause. In this review it was found that the original x-ray showed an oblique fracture of the femoral neck in almost every case. This is Pauwel's type III fracture.

From 1939 to 1940 one case was done. In 1941 there were four cases done; 1942, two; 1943, eight; 1944, eleven; 1945, thirteen; 1946, thirteen; 1947, eleven. Follow-up of these cases may be seen in Table II.

The treatment after operation is plaster fixation in a hip spica for twelve weeks followed with bed rest without plaster for an additional four weeks. Then weight-bearing is permitted. Active toe exercises and active quadriceps exercises thirty times every hour for ten hours a day are begun immediately after reaction from the anesthetic. The active exercises are continued after removal of the plaster. When the patient has done the exercises vigorously and regularly, there is the same amount of motion in the toes and ankle on removal of the plaster as before operation. There is 20 to 30 degrees of knee flexion present. Motion is then quickly gained in the knee to about 90 degrees of flexion from complete extension. There is a loss of flexion beyond 90 degrees in the knee. Hip motion from complete extension averaged 45 to 55 degrees in flexion; there was no rotation internally or externally. There was abduction of 15 to 20 degrees and adduction to neu-



1A 1B

FIG. 1. Patient E. S., oblique fracture femoral neck. A, preoperatively, May 4, 1947; B, end result, fracture healed December 22, 1947.

We believe that non-union in fractures of the femoral neck is due to the type of fracture, that is, the oblique or vertical fracture fails to heal when treated with internal fixation. For a number of years we have classified fractures of the femoral neck as follows: transverse subcapital fracture, transverse fracture through the neck, oblique fracture of the neck, oblique comminuted fracture of the neck and fracture of the base of the neck. The transverse subcapital fracture and transverse fracture through the neck are treated with internal fixation. Fracture of the base of the neck is treated with angle plate internal fixation. The oblique and oblique comminuted fractures of the femoral neck are treated with McMurray osteotomy for the acute fractures. (Table I, Figs. 1 and 2.)

We have been doing osteotomies for acute femoral neck fractures in these cases since 1941.

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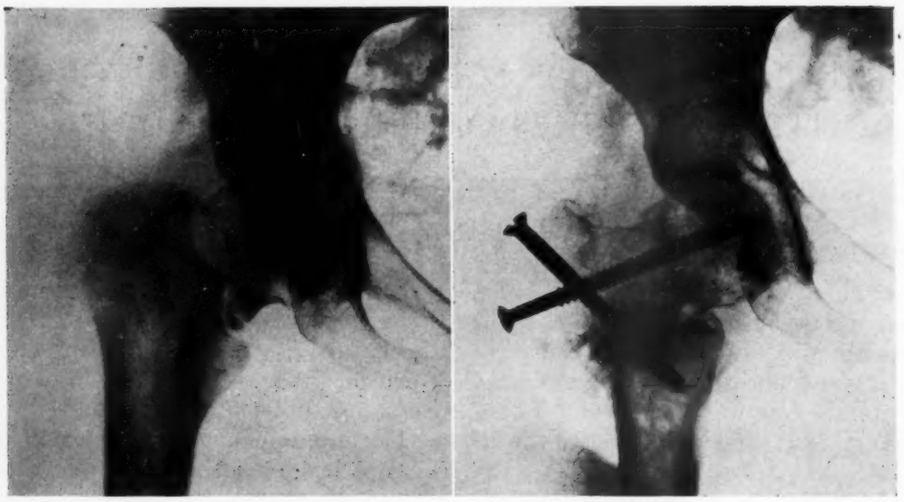

2A 2B

FIG. 2. Patient M. A., oblique comminuted fracture femoral neck. A, preoperatively, March 26, 1946; B, end result, February 26, 1947.

tral position. Some patients have difficulty putting on their shoes and stockings for a long time. The average shortening was from ¾ to 1 inch.

The end result x-ray showed union of the original fracture and osteotomy in the oblique comminuted fracture of the femoral neck. In the simple oblique fracture of the femoral neck the end result x-ray failed to show union of the fracture of the neck in most cases. There was union of the osteotomy site. Twenty-two end result x-rays of osteotomies performed for acute oblique fracture of the femoral neck showed union of the original oblique fracture in five cases only. There was non-union of the original oblique fracture in seventeen cases. The osteotomy was healed.

The osteotomy was performed by open operation in every case with exposure of the fracture site and subtrochanteric area. In some cases the osteotomy was done without internal fixation. In other cases the osteotomy was performed and the trochanter fixed to the shaft by internal fixation. In some cases the osteotomy was performed and the trochanter was fixed to the head fragment and also to the shaft by internal fixation. The method of fixation did not influence the end result. Internal fixation made the patient more comfortable during convalescence.

In case of patients who were not obese and had good vitality we permitted weight bearing in hip spica from eight to twelve weeks postoperatively. The patients were then put to bed for four weeks following removal of plaster. No weight bearing was permitted until sixteen weeks postoperatively without protection.

The oblique fracture of the femoral neck makes up about 15 per cent of all cases of fractures of the femoral neck. This 15 per cent is about the number of non-unions reported so frequently by many clinics. The oblique fracture can be determined by x-ray examination.

The end results can be found in Table III. The end results in the good group varied from five months to six years and ten months in duration. Ten cases were followed up three years or over; nine additional cases were followed up over one year. In the fair group the follow-up varied from nine months to twenty-six months in duration. Five cases were followed up one year or over. The end results in the poor group varied from six months to four years in duration. Five cases were followed up three years or over; four additional cases were followed up over one year. Of the poor end result group there were ten patients who never got out of bed after the accident. In all these patients the osteotomy site healed. Of these patients with fracture of the neck of the femur there is a group in which the fracture or osteotomy may heal solidly, but during convalescence there is deterioration of the individual so that he never gets about again.

During this period of study there were seven other cases of non-union of the femoral neck treated with osteotomy. In three of these cases it has been over four years since operation.

TABLE I

Patient	Sex	Injured	Age	Type Fracture	Operation	Operative Time (min.)	End Result of Osteotomy	Primary Osteotomy Treatment for This Study
1939–1940								
J. H.	M	4/2/39	61	Non-union	2/24/40	35	10/17/47 (7 yr. P.O.) flexion 75; abduction 25	Not included in study
L. M.	M	12/23/39	54	Non-union	7/1/40	65	10/17/47 (7 yr. P.O.) flexion 90; abduction 25	Not included in study
J. T.	M	4/2/39	61	Oblique	4/2/39	38	Walking 11 mo. with stiffness; died 1941	Deceased
1941								
M. F.	F	7/1/41	71	Oblique	7/1/41	50	12/10/45 (4 yr. P.O.) walks well; flexion 45	Good
O. F.	M	4/15/41	77	Oblique	4/15/41	30	2/20/48 (6 yr. 10 mo. P.O.) no complaints	Good
A. F.	F	12/1/41	81	Oblique	12/1/41	35	Convalescence satisfactory; died 1 yr. later	Deceased
I. N.	F	12/22/41	74	Oblique	12/22/41	42	1/29/48 (6 yr. P.O.) no complaints	Good
1942								
C. D.	F	1/24/42	90	Oblique	1/25/42	45	2/20/48 (6 yr. P.O.) no complaints	Good
L. J.	F	1/30/42	60	Oblique	1/30/42	35	Moved out of state	Unknown
1943								
H. S.	F	4/2/43	67	Non-union	10/7/43	30	1/7/48 (4 yr. P.O.) flexion 45; abduction 25; no complaints	Not included in study
E. P.	F	4/23/43	47	Oblique	4/23/43	35	2/13/48 (4 yr. 8 mo. P.O.) flexion 75; neutral position; pain at times	Good
W. McG.	M	5/22/43	58	Oblique	5/22/43	23	Died 8 mo. later	Deceased
C. S.	M	9/2/43	80	Oblique	9/2/43	30	Died 6 mo. later	Deceased
E. B.	F	9/2/43	57	Oblique	9/2/43	60	Infected; head removed; 1/5/48 (4 yr. P.O.) walks with cane	Poor
L. L.	F	10/24/43	74	Oblique	10/24/43	40	Unknown	Unknown
C. W.	M	9/12/43	76	Oblique	9/12/43	25	Died 18 mo. later	Deceased
L. S.	F	11/2/43	81	Oblique	11/2/43	62	Died 20 mo. later	Deceased
M. K.	F	11/17/43	68	Oblique	11/17/43	40	Died 5 wk. later	Deceased
1944								
E. S.	F	1/20/44	64	Oblique	1/20/44	50	Unknown	Unknown
M. M.	F	5/28/44	58	Oblique	5/28/44	15	2/17/48 (3 yr. 6 mo. P.O.) no complaints	Good
S. F.	M	1/2/44	47	Oblique	1/2/44	35	2/12/48 (3 yr. P.O.) flexion 90; abduction 20; no complaints	Good
M. M.	F	4/8/44	40	Oblique	4/8/44	40	1/20/48 (3 yr. 8 mo. P.O.) no complaints	Good
I. D.	F	6/24/44	82	Oblique	6/24/44	25	Died 1 yr. later	Deceased
K. H.	F	12/23/44	64	Oblique comminuted	12/23/44	47	Never got out of bed	Poor
A. L.	F	12/28/44	70	Oblique comminuted	12/28/44	25	2/10/46 (14 mo. P.O.) flexion 50; walked well; died 18 mo. later	Deceased
A. F.	F	9/22/44	62	Oblique	9/22/44	48	1/10/48 (3 yr. 4 mo. P.O.) unable to get about	Poor
E. B.	F	9/22/44	70	Oblique	9/22/44	50	2/14/48 (3 yr. 5 mo. P.O.) no complaints	Good
E. S.	M	10/28/44	62	Oblique	10/28/44	34	2/17/48 (3 yr. 3 mo. P.O.) no complaints	Poor

TABLE 1—(*Continued*)

Patient	Sex	Injured	Age	Type Fracture	Operation	Operative Time (min.)	End Result of Osteotomy	Primary Osteotomy Treatment for This Study
M. K.	F	8/21/44	66	Oblique	8/21/44	39	Died 2 yr. later	Deceased
1945								
M. K.	F	1/29/45	74	Oblique comminuted	1/29/45	56	1/15/48 (3 yr. P.O.) cannot get about	Poor
E. R.	F	1/24/45	64	Oblique	1/24/45	50	2/17/48 (3 yr. P.O.) no complaints	Good
G. K. T.	M	2/4/45	49	Oblique	2/4/45	50	2/17/48 (3 yr. P.O.) states it is of no importance how his hip functions	Poor
E. M.	F	1/24/45	75	Oblique	1/24/45	68	3/5/46 (14 mo. P.O.) no complaints	Good
C. V. D.	F	5/7/45	68	Oblique	5/7/45	40	6/10/46 (1 yr. P.O.) walking well; unknown since	Unknown
N. W.	F	12/30/45	55	Oblique	12/30/45	30	6/10/46 (1 yr. P.O.) walking well; could not put on shoes	Unknown
H. McI.	M	1/9/45	46	Non-union	1/9/46	15	1/6/48 (2 yr. P.O.) no complaints; does everything	Not included in study
R. J.	M	9/11/45	47	Non-union	5/18/46	42	2/8/48 (2 yr. 6 mo. P.O.) no complaints; does regular work	Not included in study
A. W.	F	6/11/45	59	Oblique	6/11/45	36	6/14/46 (1 yr. P.O.) no complaints; walking well	Good
T. H.	F	7/11/45	58	Oblique	7/11/45	50	Unknown	Unknown
I. R.	F	1/22/45	66	Oblique	1/22/45	37	Unknown after 6 mo.	Unknown
C. W.	F	7/17/45	72	Oblique	7/17/45	40	2/18/46 (1 yr. P.O.) pain in hip and knee	Fair
M. A.	F	6/10/45	72	Oblique	6/10/45	38	1/6/48 (18 mo. P.O.) no complaints; could not do much walking for cardiac condition	Poor
M. B.	F	10/15/45	68	Oblique	10/15/45	35	1/8/48 (26 mo. P.O.) does housework; tires easily	Fair
E. L.	M	2/6/45	69	Oblique	2/6/45	40	9/22/47 (31 mo. P.O.) flexion 65; doing everything	Good
1946								
L. W.	F	1/6/46	61	Non-union	9/13/46	50	2/16/48 (16 mo. P.O.) does housework	Not included in study
M. J.	F	12/18/46	65	Oblique	12/18/46	50	2/17/48 (14 mo. P.O.) flexion 60; knee very stiff and painful	Fair
M. A.	F	3/26/46	77	Oblique	3/26/46	35	2/18/48 (22 mo. P.O.) no complaints	Good
E. L.	F	5/12/46	67	Oblique	5/12/46	44	2/28/48 (20 mo. P.O.) flexion 45; doing all housework	Good
M. S.	F	9/25/46	65	Oblique	9/25/46	45	Unknown	Unknown
M. B.	F	11/4/46	69	Oblique	11/4/46	50	Unknown	Unknown
F. K.	F	12/1/46	70	Oblique	12/1/46	34	Unknown	Unknown
G. C.	F	6/4/46	58	Oblique comminuted	6/4/46	34	2/17/48 (19 mo. P.O.) no complaints; does everything	Good
A. H.	F	6/6/46	68	Oblique	6/6/46	39	12/10/47 (18 mo. P.O.) never got out of bed	Poor
H. J.	F	7/8/46	65	Oblique	7/8/46	34	2/16/48 (18 mo. P.O.) many complaints; flexion 50	Poor
J. G.	M	1/9/46	69	Oblique	1/9/46	45	10/6/47 (21 mo. P.O.) walking well; pain at times	Fair
L. L.	F	6/10/46	72	Oblique	6/10/46	36	2/1/48 (13 mo. P.O.) knee painful; hip excellent	Good

TABLE I—(*Continued*)

Patient	Sex	Injured	Age	Type Fracture	Operation	Operative Time (min.)	End Result of Osteotomy	Primary Osteotomy Treatment for This Study
F. S.	F	12/23/46	72	Oblique	12/23/46	36	1/5/48 (1 yr. P.O.) walking well; no complaints; has non-union 18 yr. duration opposite hip	Good
N. M.	F	9/6/46	68	Oblique	9/6/46	40	1/29/48 (16 mo. P.O.) doing everything	Good
E. K.	M	1/9/46	36	Non-union	1/9/46	36	2/7/48 (25 mo. P.O.) working; tires at end of day	Not included in study
1947								
J. O.	M	2/11/47	68	Oblique	2/11/47	55	12/6/47 (10 mo. P.O.) many complaints; cannot get about	Poor
S. A.	F	6/10/47	89	Oblique comminuted	6/10/47	36	2/13/48 (8 mo. P.O.) never got out of bed	Poor
S. P.	M	8/4/47	53	Oblique comminuted	12/3/47	53	Under treatment	Under treatment
J. T.	M	5/10/47	82	Oblique	5/10/47	30	2/13/48 (9 mo. P.O.) flexion 45; walking with cane	Good
A. K.	F	5/9/47	68	Oblique	5/9/47	35	12/6/47; flexion 45; knee stiff; died 1/10/48	Deceased
F. S.	F	5/4/47	67	Oblique	5/4/47	40	2/12/48 (9 mo. P.O.) flexion 75; walks well; slight pain at end of day	Good
J. D.	M	1/10/47	68	Oblique	1/10/47	38	2/1/48 (1 yr. P.O.) no complaints; knee stiff; cannot put on stockings	Fair
C. L.	F	3/28/47	58	Oblique	3/28/47	50	11/12/47 (8 mo. P.O.) never got out of bed	Poor
C. W.	M	4/1/47	72	Oblique	4/1/47	36	12/5/47 (8 mo. P.O.) sitting only; walking not attempted	Poor
F. G.	F	5/23/47	72	Oblique	5/23/47	40	11/15/47 (6 mo. P.O.) never got out of bed	Poor
M. R.	F	1/5/47	21	Oblique	1/5/47	30	2/18/48 (13 mo. P.O.) no complaints; flexion 90; abduction 20	Good

TABLE II

Year	End Result	Unknown	Deceased
1939–1940	0	0	1
1941	3	0	1
1942	1	1	0
1943	2	1	5
1944	7	1	3
1945	9	4	0
1946	10	3	0
1947	9	1	1

TABLE III

Year	Cases	Good	Fair	Poor
1939–1940	0	0	0	0
1941	3	3	0	0
1942	1	1	0	0
1943	2	1	0	1
1944	7	4	0	3
1945	9	4	2	3
1946	10	6	2	2
1947	9	3	1	5
Total	41	22	5	14

The total number of cases treated with osteotomy for acute fractures was sixty-three. Three cases, G. K. T., E. L., and S. P., had failure of the first osteotomy performed. A repeat osteotomy was done with a satisfactory end result. There were forty-eight females and fifteen males in the acute group. The operative time varied from fifteen minutes to sixty-eight minutes, with an average of thirty to forty minutes. The ages varied from twenty-one to ninety years, with the majority occurring in the group from sixty-one to seventy-five years.

SUMMARY

An end result study of forty-one cases of acute oblique fractures of the femoral neck is submitted. The McMurray osteotomy is an excellent method of treatment in these cases primarily. The osteotomy site healed. In this type of fracture of the femoral neck an osteotomy prevents reoperation for non-union.

LUCIEN Leger recently reported twenty-two instances of phlebitis of the anterolateral thoracic wall (Mondor's disease). In many of these cases an indurated, fibrous, cord-like band some 20 cm. long or more was present in the lower axilla, apparently unassociated with any other chest lesion. The etiology is obscure but therapy is by surgical extirpation if there is moderate pain or if the lesion persists for a long time. One patient had this disease for eight years. Often the band is imperceptible except when the arm is abducted. There is usually no associated adenopathy but surgery is often indicated because the patient or doctor fears a possible malignancy may supervene. The condition is rare. (*Richard A. Leonardo, M.D.*)

CANCER OF THE STOMACH*

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DURING World War II over 300,000 men were killed in action and approximately an equal number of persons were killed by cancer of the digestive tract. One-third or 100,000 of the deaths from cancer were caused by cancer of the stomach, and reliable estimates show that within ten years the death toll exacted annually by this disease will exceed 40,000. Since neoplasms have attained a position second only to cardiovascular disease as a cause of death and the number of persons dying annually from malignancies of the stomach is constantly rising, the problem of gastric cancer has become an increasingly serious one warranting unrelenting study and frequent critical review.

The purpose of this paper is to present an analysis of 1,004 patients with cancer of the stomach admitted to Hines Hospital during the years 1931 to 1947, inclusive. The hospital serves as a tumor center and receives large numbers of cancer patients from an extensive geographic area. These patients come from many states, are of different social backgrounds and have available the services of doctors whose ability, training and equipment vary from that of the most rural practitioner to the highly trained medical center specialist. This study may be considered to represent, therefore, a cross country view of what is happening to the 38,000 persons doomed to die annually from cancer of the stomach.

A detailed study has been made of each of our records noting age, onset and duration of symptoms, important physical, laboratory, x-ray and pathologic findings, types of operations, operative mortality and survival time. Due to the hospital policy of up-to-date maintenance of records on all tumor cases and to the diligent work of the tumor registration department, follow-up reports have been obtained on practically 100 per cent of these patients.

In a total of 170,962 hospital admissions 21,160 patients had cancer, and in 1,004 of these the malignancy was located in the stomach. Expressed in percentages, 0.5 per cent of the total admissions and 4.7 per cent of the cancer patients had carcinoma of the stomach. Since cancer is not a reportable disease, the incidence of cancer of the stomach as recorded has been found to be influenced by many factors. Recently Pack and McNeer[1] in a collective review emphasized the discrepancies existing between actual occurrence and recorded morbidity. This they explain on the basis of differences in diagnosis technics, dissimilar statistical methods, inequalities in public health education and medical care and to the fact that no cognizance is taken of cured or undiagnosed cases in the compilation of death rates. Obviously, they point out, it is not possible to draw definite conclusions as to the exact incidence of cancer prevalence; however, institutional reports and mortality records give most reliable indices.

Male susceptibility to carcinoma of the stomach is a well known fact. The greater frequency of occurrence in men may vary in a ratio of from 3:2 to 3:1. Vital statistics[2] show in 26,135 deaths from cancer of the stomach 16,111 (61.6 per cent) were males and 10,024 (38.4 per cent) females, representing 21.4 per cent of the total cancer deaths in men and 12.1 per cent of those in women. At the Presbyterian Hospital, Chicago, Illinois, one of us with Gatewood observed a ratio of 67.5 per cent males to 33.2 per cent females in 500 patients. The Mayo Clinic[3] reports an incidence of 78.7 per cent in males compared with 21.3 per cent in females, and at the Memorial Hospital, New York, New York, a ratio of 68.5 per cent males to 31.5 per cent females was found by Pack and McNeer. Because of the relatively few females admitted to Hines Hospital no women were included in this study.

Age plays an important role in the develop-

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ment of gastric cancer. Since the disease occurs predominantly in the older age groups, as life expectancy is extended increasing numbers of carcinoma of the stomach will inevitably be found. The youngest patient in our series was twenty-one and the oldest seventy years

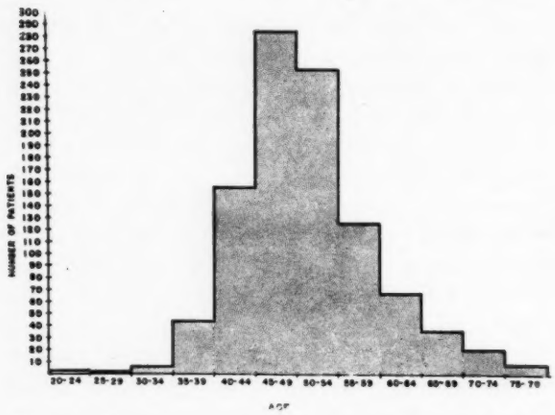

FIG. 1. Shows low average age of 50.6 years due to comparative youth of entire group.

of age. Four patients were within the twenty to twenty-four year age group and nine were between seventy-five and eighty. During 1931 the average age was forty-four years but by 1945 it had risen to 53.2 years. The average age for the entire series was 50.6 years. (Fig. 1.) Our figures are low compared with 1940 census figures which show that 23.8 per cent of all gastric cancer deaths in the United States occur in those above the age of seventy-five and 16.7 per cent occur between the ages of sixty-five and seventy. To explain these differences one need only recall that our patients are largely veterans of World War I who are only now attaining the age at which cancer of the stomach can be expected to occur more frequently.

In attempting to evaluate symptoms which might serve as clues to early cancer it must be remembered that unless an obstruction is produced due to location of the growth in either the prepyloric or cardiac portion of the stomach a gastric cancer may become comparatively large and pathologically a late lesion before any appreciable symptoms appear.

All complaints of our patients were carefully scrutinized and classified according to the order of their appearance. Pain, loss of weight and vomiting were the presenting early complaints in the order given. Loss of appetite, fullness and indigestion followed while constipation and tarry stools appeared still later. (Table 1.) A certain amount of inconsistency was present in that symptoms which occurred early in some patients appeared late in others. On physical examination 48 per cent had a palpable tumor and 39 per cent were cachectic,

TABLE 1
ORDER OF COMPLAINTS

Symptoms	1	2	3	4	5	Total	Per cent
Pain	502	117	71	29	4	723	72
Weight loss	32	159	288	201	53	740	74
Loss of appetite	58	73	53	26	10	222	22
Fullness	67	87	29	18	6	208	20
Indigestion	59	65	30	6	0	147	14
Vomiting	70	249	151	50	14	535	53
Constipation	8	12	12	26	211	280	28
Tarry stool	5	25	39	42	15	132	13
Dysphagia	55	22	9	8	2	98	9
Knowledge of tumor	10	10	11	15	9	65	6
Regurgitation	7	25	13	6	2	53	5
Diarrhea	8	11	17	7	3	47	4
Hemorrhage	12	11	10	1	3	37	3
Anemia	5	4	3	4	7	23	2
Jaundice	4	5	10	8	9	36	3

both manifestations of pathologically advanced disease. Engel[4] suggested that pain, loss of weight, anemia, nausea, hematemesis and a palpable mass be discarded as signs of early stomach cancer and stated the only early consistent symptoms in his experience were fatigue, weakness, anorexia, loss of desire for meat and indigestion of a mild type related to meals. If the symptoms of loss of appetite, fullness and indigestion which occurred as early complaints in our patients are grouped and considered together, their incidence of 56 per cent may be of some significance viewed in the light of Engel's suggestions.

An average of nineteen months elapsed between the onset of first gastrointestinal symptoms and admission of these patients to the hospital. Years ago the symptoms of gastric cancer were arbitrarily divided by Ketsh[5] into periods of absolute latency, relative latency and a final period of apparent disease. Because symptoms during the early periods are absent or exceedingly mild, many of our patients ignored, minimized or self-treated their complaints, allowing weeks and months to pass before seeking the advice of a physician. Approximately 30 per cent had

followed ulcer management at some time during the course of their disease and 75 per cent of these obtained relief from pain. As a result of their apparent improvement the patient and at times the doctor had been lulled into a state of false security. In some instances x-rays had not been made until the disease was far advanced, in others surgical consultation had been delayed and a few obstinate patients had refused to accept the advice of their physicians and surgeons. Although our study of symptoms produced no new findings, the results serve to again emphasize the futility of expecting diagnoses of early lesions to be made as long as reliance is placed upon the onset of signs and symptoms as indicators of the presence of disease.

LABORATORY FINDINGS

Blood Examination. Definite anemia with hemoglobin readings below 70 per cent was found in 271 cases or 30 per cent of our examinations and blood smears showed the presence of pernicious anemia in 3 per cent of the cases, an incidence somewhat below the usual 5 per cent occurrence. Both a macrocytic and a microcytic type of anemia were present, the microcytic type occurring more frequently. In patients who have anemia with associated achlorhydria or hypochlorhydria a false diagnosis of pernicious anemia may easily be made due to the resemblance of the macrocytic type to that disease. Statistical studies have previously shown the coexistence of cancer of the stomach and pernicious anemia is something more than wholly accidental. Doehring and Eusterman[6] in a study of 293 cases of pernicious anemia found an incidence of thirty-eight cancers of the stomach whereas the normal expectancy was twelve. Pernicious anemia was known to be present in those patients for an average of 8.7 years before onset of cancer symptoms. Recently Kaplan and Rigler[7] found the incidence of carcinoma of the stomach to be twenty times the normal expectancy in living patients who have pernicious anemia and three times as frequent in those who die of the blood dyscrasia. It is possible if full advantage were taken of this known incidence and all patients with pernicious anemia subjected to periodic examination for cancer of the stomach, early gastric malignancies would be discovered which at present pass undiagnosed.

Stool Examination. Sufficient emphasis, we believe, has not been given to the frequency with which occult blood occurs in the stools of patients who have carcinoma of the stomach. The benzidine test was positive in 954 cases or 95 per cent of our patients so examined, and 132 of this group (13 per cent) had tarry stools. Granted that most of these patients had pathologically advanced carcinomas and the more advanced the lesion the more likely occult blood is to appear in the stool, extremely small, early lesions also gave sufficient quantities of blood to be easily identifiable by chemical test. Although stool specimens are inconvenient to obtain and some patients are uncooperative, the possibility of even an occasional discovery justifies use of this simple test as part of every complete physical examination in patients past forty years of age.

Gastric Analysis. Probably the most valuable of all laboratory findings is the well known absence or decrease of free hydrochloric acid in the gastric juice. Reports of gastric analyses were available in 792 of our cases. Achlorhydria or hypochlorhydria was found in 665 (84 per cent), normal acidity in eighty-seven (11 per cent) and hyperacidity in forty (5 per cent). Although cancer of the stomach may occur in the presence of normal or even hyperacidity, it is the opinion of Hebbel and Gaviser[8] that if the triple histamine test is used almost 90 per cent of patients with cancer of the stomach will show less than 30 units of free hydrochloric acid. Consideration also must be given to the fact that approximately 30 per cent of normal individuals over fifty years of age will likewise exhibit achlorhydria or hypochlorhydria. Therefore, while gastric analysis is not diagnostic, subnormal acid readings immediately place under suspicion a group of patients in which carcinoma of the stomach is more likely to occur.

Gastroscopic and cytologic methods for studying the stomach have been utilized at the hospital since the time their value was first demonstrated. Due to the fact, however, that our analysis began with the year 1931 and many of the patients included in this report had neither of these examinations, results obtained will be included in a later presentation.

X-RAY EXAMINATION

Too great emphasis cannot be placed on the importance of x-ray examination in the diagno-

sis of malignant lesions of the stomach. Eight hundred one of our patients were examined under the fluoroscope and roentgenograms made. In 793 cases or 99 per cent a lesion of the stomach was found while in eight patients the x-ray findings were reported as negative. Seven hundred thirty-seven (92 per cent) were diagnosed correctly as malignant growths, thirty-six (4.5 per cent) incorrectly as benign ulcers and twenty (2.5 per cent) as unspecified types of growths. Over a period of years numerous reports have firmly established the value of x-ray in determining the presence of gastric cancer. The roentgenologist by skillful use of modern equipment has attained a diagnostic accuracy far superior to that of the clinician, in many instances exceeding 90 per cent. Although he may reach a lesser degree of perfection in differentiating some of the lesions, by his mere discovery of abnormal findings in the stomach he places the patient under immediate suspicion.

Most studies of the value of x-ray examination have been made on patients in whom symptoms already were present and few reports are to be found of observations on patients without symptoms. In a fluoroscopic study of 2,413 asymptomatic, normal individuals over fifty years of age St. John, Swenson and Harvey[9] discovered three malignancies. Wylie,[10] studying 400 German prisoners who had gastrointestinal complaints, found an incidence of 1 per cent. Rigler[11] reported a combined study in which preliminary screening reduced the number of patients which he x-rayed to approximately 30 per cent of the original group. All 544 of these patients were past fifty years of age, without symptoms, and had free hydrochloric acid values of less than 30 units. By taking semi-annual x-rays of this selected group three carcinomas and nineteen polypi of the stomach were discovered. Although the cost of comprehensive methods of detection are high in proportion to the number of cancers found, it must not be forgotten that fluoroscopic and roentgenogram examinations at the present time are, as emphasized by Abrahamson and Hinton,[12] the best and usually only means of identifying the silent, truly early cancer of the stomach.

TREATMENT

Six hundred twenty-eight of our patients (62.8 per cent) were operated upon and 376 (37.4 per cent) had no operation. The reasons for not operating were as follows: Two hundred twenty-five were considered too sick to tolerate operation because of extensive metastases, ascites and other signs of general spread of the disease. One hundred eighty-seven died within ten days after admission. Eight records stated no specific reason why operation was not carried out; however, in most of these the carcinoma was extensive. Nine patients considered to be operable refused operation and three went elsewhere for their surgery. In 123 patients the cancer was so far advanced at the time of operation that only laparotomy could be done. Palliative procedures of gastroenterostomy, gastrostomy, ileosigmoidostomy and closure of a perforation were considered maximum surgery feasible in 186 patients. Thus from an initial total of 1,004 patients only 319, less than one-third, remained upon whom resection could be performed.

Fifty-four of the 319 patients died as the result of operation—a postoperative mortality rate of seventeen per cent. Pulmonary complications caused the largest number of these deaths and peritonitis was second in frequency. Palliative procedures were followed with a higher hospital mortality than were resections. Thirty-five per cent of the patients who underwent explorations, 25 per cent of the patients with gastroenterostomies and 85 per cent of those with gastrostomies never left the hospital. Similarly high mortality figures following palliative procedures are reported by Livingstone and Pack,[13] Maimon and Palmer,[14] and State, Moore and Wangensteen.[16]

RESULTS

Three hundred seventy-six of our patients entered the hospital with no chance of being cured because of the extensiveness of their tumors at the time of admission. Of the 628 remaining who were deemed operable, 309 proved to have cancer advanced to a degree which limited operative procedures to explorations and palliations, leaving 319 patients upon whom gastric resection could be performed. A postoperative mortality rate of fifty-four (17 per cent) further reduced the number of possible cures to 265. Thus of a total of 1,004 patients, approximately only one patient in four was in the physical condition at the time he entered the hospital to undergo and survive gastric resection. (Fig. 2.)

Patients considered inoperable and given only supportive treatment died within 4.5 months. Those who were explored lived seven months; in cases in which gastroenterostomies and jejunostomies were done and the patient left the hospital the survival time was 8.5 months.

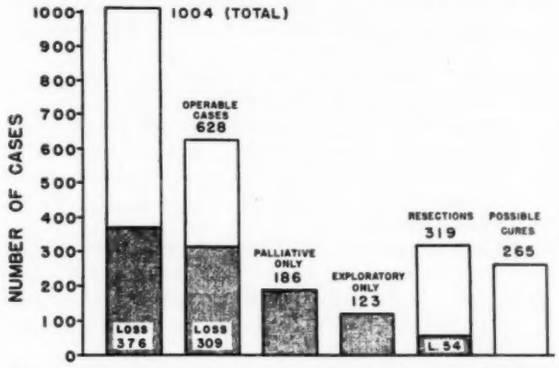

FIG. 2. Shaded columns represent patients lost from chance of possible cure because of their inoperability, limited operability or postoperative deaths.

The patients with resections, now dead, lived an average of 3.5 years, and those with resections who are still living have averaged 4.5 years of life since operation.

For the purpose of determining five-year survivals those patients admitted prior to 1943 were selected. A total of 740 of these patients had clinical diagnoses of carcinoma and 474 had microscopically proven cancer. Two hundred nineteen gastric resections had been performed on this group and after deducting forty-six postoperative mortalities 173 remained as possible cures. (Fig. 3.) During the five years following their resection 138 patients died and thirty-five lived. Expressed in percentages, 5 per cent of the total, 7.4 per cent of the proven and 16 per cent of the patients with resections survived five years after operation and should have a normal life expectancy. Analyzing our results still further we found three patients had survived five years but eventually died of carcinoma and one patient survived five years with subsequent recurrence of his lesion. Subtracting the failures from the survivals we have eleven patients who survived five years and died without cancer and twenty patients living without evidence of the disease—a five-year survival rate of 6.5 per cent.

COMMENTS

Although radical surgical treatment is the only known curative treatment for cancer of the stomach, it is evident from these studies that the vast majority of gastric cancer patients entering a large general hospital are doomed to die without having even a chance to receive such treatment. The reason for this lamentable fact, while quite obvious, neverthe-

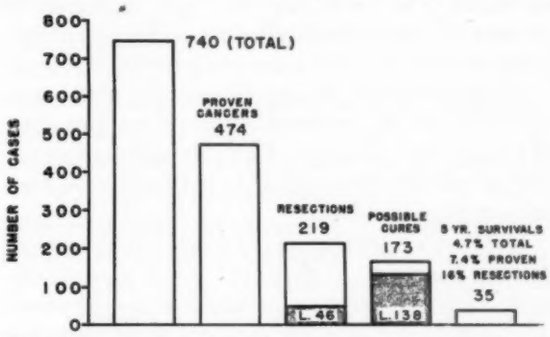

FIG. 3. White columns represent the clinical and microscopically proven cancers, the resections and five-year survivals; shaded columns represent the postoperative and five-year losses.

less bears repeating. Gastric cancer with its masked approach and characteristic insidious onset produces no symptoms in the early stages, but only after the growth has developed to pathologically advanced, inoperable proportions do so-called early diagnostic symptoms lead to its discovery. Reliable observers have estimated carcinoma of the stomach may be present for fifteen to twenty months without noticeable symptoms, and during an additional four to six months the complaints may be of such a vague nature the patient still deems consultation unnecessary. After months have elapsed and consultation is finally sought the doctor, disarmed by the vagueness of the symptoms, may delay an additional period before making complete studies. Meanwhile the cancerous invader has silently extended, frequently metastasized and opportunity for treatment of early cancer is lost.

The use of penicillin, the sulfonamides and newer surgical technics has extended the limits of operability and resectability and reduced mortality rates following operation to a point beyond which appreciably greater gains cannot be expected. It is obvious, therefore, that if progress is to be made our efforts must be directed toward diagnosis of pathologically earlier lesions. Until such time as prevention or specific cure is discovered, our greatest hope for bettering results lies in the diligent, intelligent employment of practical methods already

known capable of revealing the presence of young cancerous growths.

CONCLUSIONS

1. An analytical study of 1,004 patients with cancer of the stomach admitted to Hines Hospital during the years 1931 to 1947, inclusive, is presented. Approximately one in four of these patients received and survived gastric resection.

2. Stool examinations for occult blood are reported on 954 patients. Ninety-five per cent of these were positive. Early, small lesions as well as advanced carcinomas produced positive benzidine reactions.

3. Most important of all laboratory tests is gastric analysis. Eighty per cent of our examinations showed an absence of free hydrochloric acid and in 4 per cent hyprochlorhydria was present.

4. Routine use of gastric analyses and benzidine tests is justified in all patients past forty years of age because of their value as clues to the presence of stomach cancer.

5. Results of fluoroscopic and roentgenographic procedures on 801 patients are reported. Abnormal findings were recorded in 99 per cent. A correct diagnosis of malignancy of the stomach was made in 92 per cent. Precancerous lesions such as polypi were discovered.

6. Since x-ray is our best and often only method of discovering early stomach cancer, every advantage should be taken of the superior diagnostic ability of the roentgenologist. Periodically x-raying those known prone to develop gastric cancer, namely, (1) all patients with achlorhydria or hypochlorhydria, (2) all patients with pernicious anemia and (3) all patients with occult blood in the stool, is a practical procedure which may profitably be employed to identify the unsuspected, silent, resectable, curable carcinoma.

Acknowledgment: We wish to thank Dr. Robert Schrek, Mr. Philip Zingraf, Hines Hospital Tumor Department, and Mrs. Mary Neal for their generous assistance in this study.

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THUMB FRACTURES AND DISLOCATIONS

A NEW METHOD OF TREATMENT

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THE author has recently described a new method of treating metacarpal fractures.[1,2] This method entailed the use of an instrument which was originally intended for all fractures involving the lateral four metacarpal bones. Since then, one part of this instrument has been used successfully in the treatment of fractures and dislocations involving the base of the thumb. This method is being reported because the end results were good, and the mechanics appear sound. (Fig. 1.)

There are three common types of injuries about the base of the thumb, namely, the simple dislocation at the carpal metacarpal joint, the fracture-dislocation or Bennett fracture, and the transverse or oblique fracture through the proximal third of the metacarpal shaft.

Pathologic Physiology. The primary cause of deformity following an injury about the base of the thumb is the pull of the strong abductor pollicus longus muscle and the thenar muscles, composed of the opponens, flexor brevis and the oblique and transverse heads of the adductors. The abductor pollicus longus muscle is inserted into the lateral side of the base of the first metacarpal bone. The thenar muscles are inserted into the shaft of the metacarpal and the base of the proximal phalanx of the thumb.

In the simple dislocation the long abductor pulls the base of the metacarpal proximally and into abduction. The thenar muscles pull the head of the metacarpal into the palm of the hand.

In the fracture-dislocation or Bennett type fracture the ulnar condyle of the metacarpal base remains in position, while the radial condyle and the shaft of the metacarpal are dislocated laterally and pulled proximally by the long abductor muscle. The head of the metacarpal is pulled into the palm of the hand by the thenar muscles.

In the simple fracture about the base of the thumb the long abductor tends to force the proximal fragment into abduction, while the thenar muscles pull the distal fragment into the palm of the hand.

Impacted fragments must be broken up thoroughly before they can be reduced. The forces necessary to correct any one of these deformities must counteract the pull of the long abductor and thenar muscles. This is a comparatively simple matter and can be accomplished easily when the surgeon pushes the base of the metacarpal distally and ulnarly with his thumb. At the same time he must pull the metacarpal head into abduction with his index finger hooked around the volar surface of the injured thumb. The surgeon's thumb will counteract the pull of the long abductor, while his index finger acts as a sling, pulling against the thenar muscles.

Comparison with Other Methods. Although any one of these deformities is easy to reduce, the great difficulty is that of maintaining the corrected position. Traction through the thumb phalanges may maintain the position but it usually results in considerable stiffness of the interphalangeal and metacarpophalangeal joints. Adhesive traction may slip. Skeletal traction is a more formidable procedure and may lead to some infection about the pin in addition to stiffness of the distal joints. When plaster of paris is used to maintain the position, it is practically impossible to exert sufficient pressure against the metacarpal base without causing a pressure sore over this area. Continuous pressure for approximately three weeks sufficient to counteract the pull of the long abductor usually results in pressure necrosis. Insufficient pressure over this area will result in subluxation or reangulation of the fragments.

The method to be described eliminates the stiffness of the interphalangeal and metacarpophalangeal joints because they are left freely movable. In contrast to plaster of paris, the pressure over the base of the metacarpal can be released and reapplied at any time, thus eliminating the possibility of a pressure sore at this area. The pressure can also be adjusted at any

time to compensate for the appearance and disappearance of post reduction swelling. It is a closed procedure and may be applied in the office without the risk of infection, contamination, slipping or necrosis of the skin.

This method of maintaining the corrected position of the fragments requires the use of the long arm of an apparatus previously described by the author.[1,2] The entire apparatus is made of plastic and nylon material, light in weight, radiolucent and reuseable. (Fig. 2.) The apparatus is anchored to the forearm with plaster of paris which also holds the wrist in ulnar deviation and slight dorsiflexion. The entire thumb is constantly exposed to full visualization, both to the eye and the roentgenogram. An adjustable pressure pad attached to a universal joint counteracts the deforming element of the long abductor by pushing the base of the metacarpal ulnarly and distally. The distal push through the base of the metacarpal eliminates the necessity of pulling on the phalanges which often results in joint stiffness. The pressure pad can be released at any time while the position is manually maintained by the physician, the underlying skin can be massaged and the pressure reapplied. This will eliminate a pressure sore. The thenar muscle pull is counteracted by a simple adhesive sling placed beneath the metacarpal head.

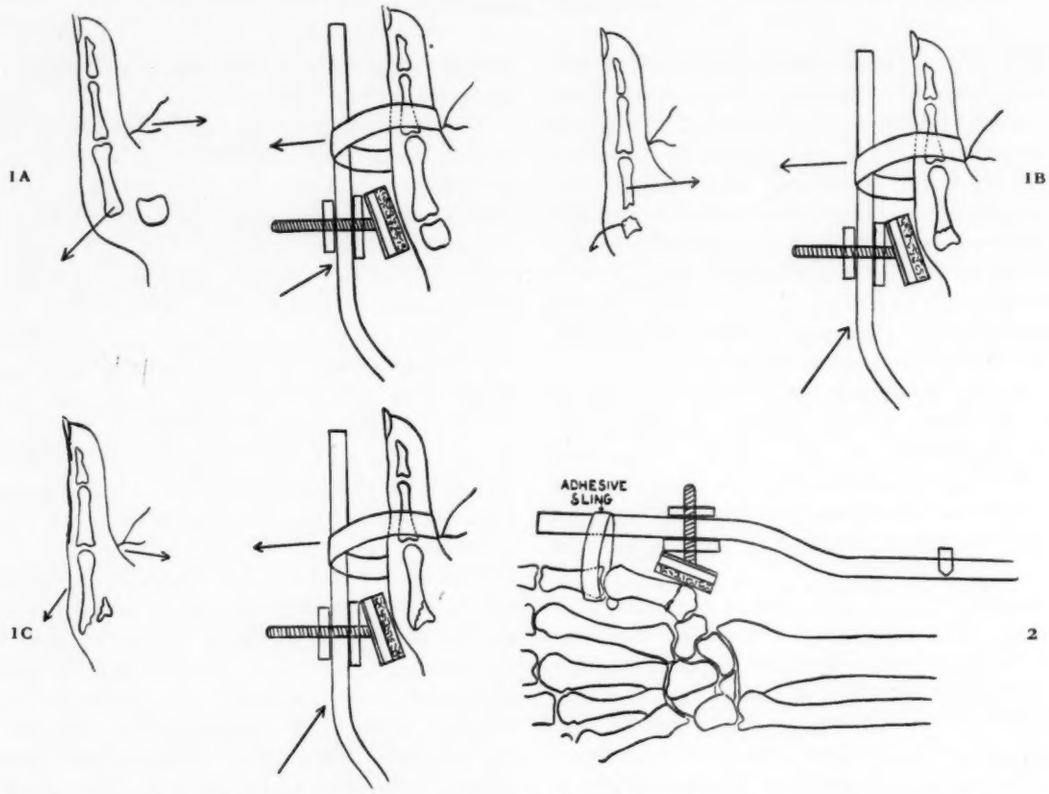


FIG. 1. The mechanism of thumb fractures and dislocations at the metacarpal base. A, dislocation; B, fracture at base; C, Bennett's fracture.

FIG. 2. A schematic drawing of the metacarpal splint applied to a fracture or dislocation at the base of the thumb. (The adhesive sling should be placed beneath the metacarpal head.)

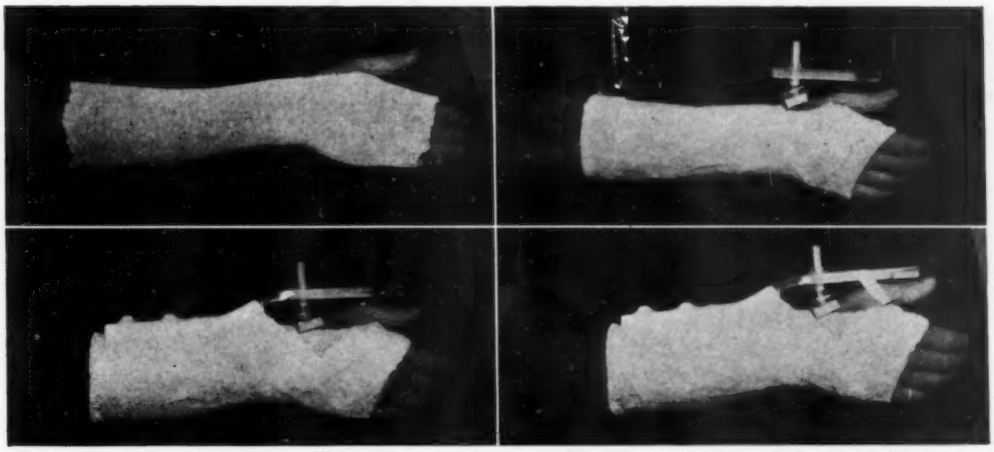
Procedure. (Fig. 3.) The fracture or dislocation must first be reduced. This can be accomplished without anesthesia, but local anesthesia is usually necessary. A general anesthetic may be required in some cases.

1. With the corrected position maintained, cover the forearm, wrist and hand with any skin glue such as Ace Adherent or compound tincture of benzoin. Shaving is not necessary.

2. With a hole cut out for the thumb, apply stockinette over the adherent part.

3. Align the thumb with the radius by placing the wrist in ulnar deviation and slight dorsiflexion. This will place the reduced thumb in the position of abduction and opposition. Apply one 4-inch roll of plaster of paris bandage

3A



3B

3C

3D

FIG. 3. A, reduce fracture or dislocation; apply Ace adherent or compound tincture of benzoin; cover with stockinette; note that hand is also covered and thumb is exposed. B, place wrist in ulnar deviation and slight dorsiflexion; apply a 4-inch roll of plaster of paris bandage from mid-forearm to distal palmar crease of hand; set long arm of splint over radial side of forearm; note angle of pressure pad which is placed transversely. C, anchor long arm of splint with plaster. D, apply adhesive sling beneath metacarpal head and anchor to the splint; adjust pressure pad over proximal end of metacarpal; it will push ulnarly and distally since it is attached to a universal joint. Every three to seven days maintain position manually, release pressure, massage skin and reapply pressure pad. Adhesive sling may be reinforced if it becomes stretched.

over the stockinette from the mid-forearm to the distal palmar crease of the hand. The thumb is left entirely exposed. In a few minutes the plaster will set.

4. Place the long arm of the instrument over the radial side of the forearm and anchor it with a 3-inch roll of plaster of paris bandage. This will also set in a few minutes.

5. Apply a ½ inch strip of adhesive around the volar side of the metacarpal head and anchor to the extending arm of the splint.

6. Place the pressure pad transversely over the base of the first metacarpal. Loosen the upper nut, hold the lower nut and turn the bolt clockwise. This will lower the pressure pad. The universal joint will allow the pad to tilt so as to face distally. When the patient feels slight pressure at this area, lock the pad into position with the upper locking nut. This pressure pad should rest against the base of the metacarpal and not on the carpal metacarpal joint capsule.

7. The following day it may become necessary to readjust the pressure if swelling ensues.

8. The patient is then seen once or twice weekly for the next three weeks. At each visit to the office the corrected position is maintained manually by the surgeon, the pressure pad is released, the skin over the metacarpal base is massaged and the pressure pad is reapplied. Never release the pressure pad without manually maintaining the corrected position.

9. If the adhesive sling should become loose, reinforce it with another piece of adhesive.

10. At the end of three weeks the splint may be removed and normal function should ensue.

CASE REPORTS

CASE 1. B. G., a fifty-five year old colored laborer sustained an injury to his thumb when he struck his hand against a stone wall while digging a foundation. He continued with his work and did not seek medical aid until eleven days later. Examination at that time revealed a moderately swollen thumb with some limitation of abduction. A definite lateral dislocation at the base of the first metacarpal could be seen. The dislocation could easily be reduced, but the fragments would become redislocated whenever the reducing forces were released. Roentgenograms revealed a typical fracture-dislocation involving the base of the first metacarpal. (Fig. 4A.) Despite the fact that the injury was eleven days old at this time and since it was so easy to reduce, it was thought that an attempt should be made to maintain the corrected position.

The long arm of the metacarpal splint was applied and anchored to the radial side of the forearm with plaster of paris. The hand and wrist were also incorporated in plaster. The pressure pad was used to exert a force of

4A 4B

FIG. 4. Case I. A, Bennett's fracture eleven days after injury and before treatment was instituted, July 6, 1948. B, fracture-dislocation reduced and held with metacarpal splint for three weeks. Roentgenograms taken August 30, 1948, show good end result.

5A 5B 5C

FIG. 5. Case II. A, February 19, 1949, roentgenograms six days after injury. Angle of fragments was 34°. Fragments were then adequately reduced under local anesthesia and a dorsal aluminum splint was applied. B, February 23, 1949, four days later roentgenogram shows reangulation to 44°. This demonstrates the effect of muscle pull. Plate taken in same relative position. C, March 15, 1949, roentgenogram taken two and a half weeks after final reduction and application of metacarpal splint. Good position, some callous deposition, full range of motion, no atrophy.

adduction and extension against the base of the first metacarpal. The metacarpal head was maintained in abduction and some opposition by a simple adhesive sling.

On subsequent visits to the office the pressure pad was released while the examiner maintained the corrected position. The underlying skin was washed with alcohol and massaged for a moment in order to improve the local circulation. The pressure pad was then reapplied. This was repeated every three to four days. Three weeks after treatment was started, the splint was removed. The patient had a full range of painless motion, and he returned to work as a laborer.

Follow-up x-rays, taken seven weeks after reduction showed a good end result, considering the fact that treatment was not started until eleven days after the fracture-dislocation. (Fig. 4B.) Clinically there was a normal range of abduction and opposition, a stable carpal metacarpal joint, no lateral prominence at the base of the thumb and no symptoms after removal of the splint.

CASE II.* J. LeR., a twenty-four year old carpenter, sustained a simple fracture through the proximal third of the shaft of the first metacarpal on February 13, 1949, when he accidentally struck his closed fist against the "fence" while playing indoor hockey. He did not seek medical aid until six days later (February 19, 1949). Roentgenograms at that

* The author is indebted to George Sotirion, M.D., of Springfield, Massachusetts, for this case.

time showed a simple fracture through the shaft of the first metacarpal with 34-degree angulation of the fragments. (Fig. 5A.) The fracture was adequately reduced, and an aluminum splint was applied in an attempt to hold the fragments in position. Check-up plates taken on February 23, 1949, (four days after the fragments had been reduced) showed that the muscle pull had caused reangulation of the fragments which measured 44 degrees at that time. (Fig. 5B.) On February 25, 1949, the fragments were again reduced. Since the fracture was now twelve days old, a general anesthetic was used, and satisfactory reduction was accomplished. The metacarpal splint was applied and left in place for three weeks.

The splint was removed on March 15, 1949. The patient had a full range of painless motion. Roentgenogram taken at that time showed good position of the fragments with some deposition of callus. (Fig. 5C.)

CONCLUSION

A new method of treating fractures or dislocations about the base of the thumb has been described. This method entails the use of a simple device which readily maintains the corrected position by the closed method. Its application is simple, and the mechanics appear sound.

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Obstetric Clinic

THE woman about to become a mother or with a new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. The very outcast of the streets has pity upon her sister in degradation, when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law brought down upon its victims by a machinery as sure as destiny, is arrested in its fall at a word which reveals her transient claim for mercy. The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in her hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly or selfishly.

OLIVER WENDELL HOLMES

3rd of the Series

ANESTHESIA

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THE importance of anesthesia as a cause of maternal death is not widely appreciated. There is good reason for this. If anesthesia is mentioned on a certificate of death, it is not tabulated by the statistician even though death is stated to have been due to the toxic action of the anesthetic itself or to aspiration asphyxia. It just disappears from view. In no case reported here was the cause of death assigned to anesthesia, but to another cause. The actual frequency of death from anesthesia cannot be discovered unless by examination of case records.

If parturition should be complicated by toxemia, tuberculosis or heart disease, for example, poor choice of anesthetic or a casual attitude toward its administration will contribute materially to the maternal death rate. And every physician knows, or should know, that anesthesia plays an important part in death following long labor and difficult or multiple operative procedures. However, that anesthesia in the absence of these complications is dangerous is not so well appreciated. It is our purpose to make this plain.

* * * *

CASE 1. A twenty-three year old primipara was admitted to the hospital shortly after dinner. She had been in labor for about two hours. Uterine contractions occurred regularly every ten minutes but they were not hard. The patient was given an enema and put to bed. No sedative was administered. Shortly afterward labor became very active. Within the hour the membranes ruptured and she was found to be fully dilated and ready for delivery. Her obstetrician was called and she was rushed to the delivery room. Administration of gas, oxygen anesthesia was begun at once as the caput was crowning.

The patient vomited so the mask was removed. When she cried out again with pain, anesthesia was resumed. She vomited again, became deeply cyanosed and ceased breathing. Artificial respiration was tried and the head

of the table lowered. After death a live baby was delivered with outlet forceps. The patient had been in the delivery room about five minutes. At necropsy the trachea and large bronchi were found filled with large food particles. Large pleural petechiae were present. The lungs showed marked congestion, edema and mucopurulent exudate in the bronchi and bronchioles.

Questions. (1) Might this patient have vomited even if she were not given an anesthetic? (2) Should she have had an anesthetic and, if so, was the anesthetic properly administered?

Answers. Of course the patient may have vomited without anesthesia. Vomiting occurs frequently in the second stage of labor but not as a rule so close to its conclusion. The anesthetic intended to relieve pain deprived her of life.

The deep inspiration which may carry vomitus into the bronchial tree occurs most frequently during induction. During a brief critical period the vomiting center is stimulated by the anesthetic agent at a time when cough and laryngeal reflexes are abolished. Prevention of vomiting depends upon carrying the patient rapidly through the second stage and into the first plane of the third stage of anesthesia. If vomiting should occur, anesthesia should be stopped at once.

The obstetrician should instruct his patient not to eat at home if she thinks that labor has begun. Food during labor increases the hazard of delivery under general anesthesia. The physical and emotional stress of labor stops gastric peristalsis so that food may remain in the stomach for many hours. Vomiting is dangerous.

The margin of safety with nitrous oxide is wide provided the anesthetist is alert to the dangers of the second stage. However, this may be said of any inhalation anesthetic. The only disadvantage of nitrous oxide is anoxia which was not a factor in this case.

Infiltration of the perineum with 0.5 per cent novocain would have been perfect for spontaneous delivery or episiotomy and clearly the anesthetic of choice.

* * * *

CASE II. After fourteen hours of good labor a thirty year old primipara was delivered spontaneously under light open mask ether given during uterine contractions. Anesthesia was satisfactory. When anesthesia was resumed for perineal repair, she struggled violently and tried to vomit but was prevented from doing so by crowding anesthesia. Suddenly she stopped breathing and her face and neck became deeply cyanosed. Respiration was re-established with a mechanical respirator and the perineum was repaired without anesthesia. Cyanosis deepened, bloody froth appeared on her lips and breathing, which had been shallow for some time, ceased. All efforts at resuscitation failed. At necropsy food particles were found in the tracheal bifurcation.

Questions. (1) When did the patient vomit? (2) Would continuous anesthesia for delivery and repair have been better than a second induction?

Answers. The anesthetist thought that he had prevented vomiting, but it is clear that he had not. Repeated attempts at vomiting while the breath is held are very dangerous. During attempts to vomit the jaws may be held so tightly closed that the mouth cannot be opened by the anesthetist. Vomitus fills the pharynx and is sucked into the lungs at the first inspiration. Anesthesia should not be pushed at this point, nor should the mask be strapped or buckled over the patient's mouth.

As a matter of fact the presence of food in the stomach should be suspected if induction is difficult or if large amounts of anesthetic are required. If coughing or retching should occur, the presence of food or fluid should be assumed. The stomach should then be emptied or another form of anesthesia substituted.

Since induction is dangerous once should be enough. Why tempt fate twice? A second anesthetic adds to the risk. The time interval between delivery and perineal repair will not be considerable if the delivery room is well organized and the third stage of labor well managed.

* * * *

CASE III. A twenty year old primipara was admitted to the hospital in active labor. Within two hours she was ready for delivery and light ether anesthesia was begun. She took it well but contractions decreased in frequency and strength and it became neces-

sary to deliver her with low forceps. Anesthesia was continued for episiotomy and delivery. The placenta was expressed without difficulty and the patient was returned to her bed. Soon afterward she vomited a large amount of fluid and undigested food, but at no time was there any sign of respiratory distress. Her blood pressure was 120/80 and the pulse rate 100. A little later cyanosis was noticed. Restlessness increased and breathing became noisy. Death occurred shortly after a small quantity of fluid was removed through a bronchoscope. At necropsy the trachea and main bronchi were congested and many of the larger bronchi contained fluid. No food particles were seen. The lower lobe of the right lung showed beginning consolidation.

Questions. (1) Were the symptoms due to aspiration? (2) How could this death have been prevented?

Answers. In all probability aspiration occurred during the period of emergence as the patient passed from the third stage of anesthesia to the second, the same critical level as of induction. The patient should not have been returned to bed until conscious. At any rate she should have been watched more closely during the period of recovery. She might have been turned on her side so as to favor escape of vomitus from her mouth. The period of emergence is much longer after ether anesthesia than after nitrous oxide. Hyperventilation with CO_2 will shorten this period.

Finding pathology in the right lung and particularly in the lower lobe is fairly good evidence that aspiration took place. It is not necessary to find food to prove the diagnosis. Aspirated fluid is more apt to gravitate to the right lung and particularly to the lower lobe because of the course of the right bronchus.

* * * *

CASE IV. A thirty year old patient who had been delivered of a live baby by high forceps was admitted to the hospital at term early in labor in her second pregnancy. After thirteen hours of labor, with membranes ruptured eight hours, the cervix was found fully dilated, with the vertex in left occipito-posterior position still unengaged. Cesarean section was decided upon and operation was begun at 2 P.M. under gas, oxygen and ether sequence. At 2:39 P.M. just after delivery of the baby the patient vomited large quantities of food although she had had no food during the twelve hours she had been in the hospital. A resident bronchoscopist who was immediately available was able to remove a considerable amount of food particles from the larynx but the patient was pronounced dead after five minutes after vomiting. At post mortem it was found that all food particles had been removed.

Questions. (1) Was the anesthetic well selected? (2) Why did vomiting occur in the middle of the operation? (3) After twelve hours in the hospital without food cannot one assume that the stomach is empty? (3) Is bronchoscopy good treatment?

Answers. Inhalation anesthetics are not ideal for cesarean section if only because they all pass the placental barrier and add to our anxiety for the safety of the baby. Uterine atony, hemorrhage and shock occur more often under general anesthesia, particularly ether, than with local anesthesia or spinal. Nitrous oxide induction may be more difficult for cesarean section than for vaginal delivery. Once self-restraint has been abolished in the second stage of anesthesia, fear and anxiety for herself and the baby may cause the patient to vomit or thrash about, slowing induction and adding to the hazards of aspiration and hypoxia. Cesarean section may not be compared with the planned surgery of the gynecologist.

Operation may not be begun until the surgical plane of ether anesthesia is well established. Often marked increase in bronchial secretion, slow emergence and troublesome vomiting add to the risk. The anesthetist, even though expert, may try so hard to carry the patient lightly in the interest of the baby, that the anesthetic level is lowered and the patient drifts back into the second stage. That is what happened in this case.

After twelve hours in the hospital one may assume that the patient's stomach is empty unless she has been in labor. In that event it should be assumed that the stomach may not be empty and vomiting should be induced. A small glass of mustard water will be easier on the patient and much more effective than gastric lavage.

Apparatus for suction should be in readiness. The head end of the operating table should be

lower than the foot. Bronchoscopy may be clearly indicated, yet as a rule it will be ineffective or too late.

* * * *

CASE V. A twenty-seven year old primipara had an assisted breech delivery after twenty-two hours of labor. Delivery took very little more than one-half hour. Ether anesthesia with open mask was well taken and no vomiting occurred. It was thought that anesthesia had to be deep for use of Piper's forceps. During labor she had been given seconal, 3 gr., on the night of admission, morphine, 1/6 gr., eight hours before delivery and morphine, 1/4 gr., two hours before.

Deep cyanosis and labored breathing with harsh unproductive cough were observed twelve hours later. After administration of oxygen the patient improved greatly. However, ten hours later she again became dyspneic and cyanotic and the pulse rate rose to 144. Bronchial breathing was noted in both lower lobes of the lungs with a few moist rales, but x-ray of the chest was negative. Death occurred four hours later.

Questions. (1) Did this patient have ether pneumonia? (2) What part did sedatives play in this case? (3) Was diagnosis possible? (4) Must anesthesia be deep for use of Piper's forceps?

Answers. Ether pneumonia as a diagnosis had better be forgotten. This patient had atelectasis due to obstruction of a bronchus and diminished pulmonary ventilation. The causative factors were long labor, splinting of the diaphragm due to pain, decreased pulmonary excursions and possibly analgesia and ether anesthesia. The anesthetic, however, appears to have been well taken. At any rate there is no record of great stimulation of the bronchial secretion.

Barbiturates like all hypnotics and sedatives do depress respiration, yet it is unlikely that seconal given so long before delivery played an important part. Morphine depresses the respiratory center, the cough reflex and the cellular respiratory mechanism. It is not wise to use it within four hours of delivery.

The earlier the diagnosis of atelectasis is made the better. If after operation or delivery, no matter what the anesthetic and occasionally when no anesthetic at all has been administered, coughing, increased pulse and respiratory rate and signs of oxygen want are observed, atelectasis is the likely cause. A keen look at the patient's chest should show asymetric movement and narrowing of the rib spaces. X-ray may not be conclusive until much later.

Deep anesthesia is unnecessary when Piper's forceps are applied to the fetal head in the pelvic excavation. Obviously the depth and duration of anesthesia add to maternal risk.

* * * *

CASE VI. This patient was twenty-six years of age, para IV. After twelve hours of labor cesarean section under gas oxygen ether anesthesia was performed for disproportion. The operating time was one hour. There was no undue hemorrhage and the patient took the anesthetic well. At the conclusion of the operation the anesthetist reported the patient's pulse could not be felt and that systolic blood pressure was unobtainable. She was thought to be in shock. She was transfused with plasma and blood, improved somewhat and was taken to her room. Cyanosis and dyspnea were then observed. With coughing, rapid pulse and rapid respiration atelectasis was believed to be present, but on auscultation and percussion chest signs were inconclusive. One-half hour later the patient had a chill and was put into an oxygen tent. Dyspnea and cyanosis steadily became worse and she died five hours after operation. Necropsy showed massive atelectasis involving the entire lower lobes of the right and left lungs, nearly all of the upper lobe of the left lung and two-thirds of the upper lobe of the right lung. General pulmonary edema was present and the smaller bronchioles were filled with watery fluid.

CASE VII. This patient was forty years of age, para II. After a labor of thirty hours during which two doses of phenobarbital, 3 gr. each, three doses of scopalamine, 1/150 gr. each, and one dose of morphine, 1/4 gr., were administered, a frank breech was broken up and delivered under ether anesthesia. The procedure took thirty minutes and no untoward symptoms were observed.

An hour later the patient's pulse rose to 130 and respirations to 38. Cyanosis appeared and gradually deepened. No breath sounds could be heard in the lower lobe of the right lung. Coughing was frequent with blood-

streaked sputum. The pulse became thready and more rapid, rising to 140. Breathing became more labored and moist rales were heard over the entire chest. Death occurred eighteen hours postpartum. Treatment included morphine, atropine and oxygen.

Questions. (1) What caused the pulmonary complication? Sedation? (2) How might it have been prevented? (3) How may the diagnosis be made before death? (4) What is the best treatment?

Answers. It is difficult to be sure about its safety when sedation has been heavy. It is often impossible to predict the effect of a combination of sedative drugs. Barbiturates depress the medullary respiratory center only when used in large doses. Morphine is a continuous depressant of respiration even in small doses. A multipara with frank breech presentation should get but little sedation. If she is blessed with good uterine contractions, so much the better, for she will need them in the second stage. If contractions are poor, they should be augmented by continuous intravenous pituitary stimulation. Good labor should not be discouraged. Many obstetricians would have performed cesarean section on this patient.

Atelectasis occurs when access of air to the lung or any part of it is prevented. Absorption of the air remaining results in collapse of the alveoli. It may result from obstruction of a bronchus by bronchial secretion, aspiration of stomach or nasopharyngeal content. Loss of laryngeal and cough reflexes under anesthesia make aspiration into the tracheobronchial tree easy. Oversedation, profound anesthesia, long operations, splinting of the diaphragm and compression of the lower lobes of the lungs all contribute to decreased pulmonary ventilation. Atelectasis may occur under any form of anesthesia. Its not infrequent occurrence under spinal anesthesia may be attributed to hypoventilation due to change in diaphragmatic action or intercostal paralysis.

The earlier atelectasis is recognized the better. Signs of oxygen want like increased pulse and respiration rate and cyanosis are inevitable. Coughing and labored breathing are common. Asymetric movement of the chest is diagnostic. On the affected side it will move less or not at all and narrowing and retraction of the rib spaces will be seen. Shift of the mediastinum to the affected side with shift of apex beat and cardiac borders will be noted when actual shrinkage of the lung occurs. Not until then will x-ray be diagnostic. Percussion and auscultation may not be relied upon for early diagnosis. Shock which follows massive pulmonary collapse is possibly due to mechanical shift interference with the great vessels of the mediastinum.

Many factors in prevention have been indicated. During emergence from anesthesia the patient should be watched carefully, turned on her side and encouraged to breathe deeply or cough. Hyperventilation with 5 per cent CO_2 and 95 per cent oxygen is valuable. In the later stage of infection and pneumonitis treatment by an internist will be indicated.

* * * *

Case VIII. A primigravida, aged twenty-two years, was admitted to the hospital in active labor. Her chest was negative, blood pressure 120/80 and her prenatal course had been uneventful. The fetal heart tones were good, the vertex deep in right occipitoanterior position, the cervix dilated one finger, and regular uterine contractions occurred every five minutes.

One hour later with the cervix dilated three fingers and the vertex just below the spines caudal anesthesia was instituted. In the next hour the cervix dilated fully and the vertex came on the perineum.

The patient was awake and cooperative, helping to move herself from her bed to the stretcher and then to the delivery table. Just prior to delivery when asked to lift her hips she failed to respond. On investigation it was noted that she had stopped breathing; apex beat and pulse were unobtainable.

Artificial respiration, intracardiac adrenalin, intravenous coramine and oxygen were given. There was no response. While these procedures were going on she was delivered of a live baby by low forceps and episiotomy. The infant, weighing 6 pounds, 8 ounces required but slight resuscitation. The total amount of metycaine solution used was 45 cc. There was no difficulty with its administration.

At necropsy inactive rheumatic heart disease involving the mitral valve was found. Chemical examination of the spinal fluid showed concentration of metycaine 2.9 mg. per cc.

Questions. (1) If mitral disease had been recognized, would caudal anesthesia have been contraindicated? (2) Was heart disease the cause of death?

Answers. Caudal anesthesia is not contraindicated for delivery of patients with cardiac disease. On the contrary, it appears to have merit. Like all anesthetics it has potential dangers. The amount of anesthetic necessary for caudal anesthesia is much greater than for spinal anesthesia. If it should be inadvertently injected into the spinal canal or make its way there, death will ensue. That is what happened in this case, probably when the patient helped to move herself from the stretcher to the delivery table.

* * * *

CASE IX. Cesarean section was elected in a patient thirty years of age who had had two early spontaneous abortions previously. For spinal anesthesia 100 mg. of procaine were injected into the subarachnoid space at the level of the third lumbar vertebra. Immediate difficulty with respiration occurred just as soon as the patient was returned to the reclining position. Respiration soon ceased. Artificial respiration, carbogen and finally adrenalin into the heart failed to revive her. Abdominal delivery after death did not save the fetus.

CASE X. A primigravida, aged twenty-five years, was admitted to the hospital in the thirty-ninth week of pregnancy. Cesarean section had been planned because the pelvic measurements were small and the fetus appeared to be large. She was not in labor.

Under spinal anesthesia using 150 mg. of procaine a live baby weighing 6 pounds, 4 ounces was delivered by classical cesarean section. Sudden death occurred twenty-five minutes after administration of the spinal anesthetic.

Questions. (1) Is spinal anesthesia safe for cesarean section? (2) What treatment should be carried out if respiratory failure or circulatory collapse should occur? (3) What is the safest anesthetic for cesarean section?

Answers. In neither case was there good reason to elect cesarean section. Procaine, 150 mg. at one dose, should be a thing of the past. Not only is 100 mg. an unnecessarily large dose, but also given in the same way it is decidedly dangerous.

Spinal anesthesia has no effect whatever on the baby, blood loss is minimal and immediate postoperative recovery is excellent. Other than safety, what more could one desire? Except in a few clinics, however, it has not found favor with obstetricians even though those experienced in its use had apparently lessened its danger. Continuous or fractional spinal anesthesia greatly reduces the risk due to the amount of the drug used and is receiving a steadily increasing measure of approval from obstetricians long opposed to administration of any spinal anesthetic; yet since as little as 50 mg. has caused sudden death, smaller amounts should be cautiously injected until the anesthetic level becomes satisfactory; 35 to 50 mg. of procaine may be sufficient, particularly if segmental block is used.

Everyday it becomes more clear that an alert, well trained anesthetist is a necessity in every hospital where obstetrics is practiced. At the moment this does not appear to be practicable everywhere. The safety of spinal anesthesia is immeasurably enhanced when administered by an expert who knows how to do it and how to cope with any emergency which may arise. It is hardly safe otherwise.

Administration of oxygen as soon as anesthesia has begun is helpful since the importance of oxygen transport is obvious. In the event of respiratory depression the bag on the anesthesia machine should be compressed with each inspiration of the patient. If breathing should stop completely, time must not be lost for if oxygen does not get to the brain for three or four minutes the patient will surely die. It is a waste of precious time to listen to the chest with a stethoscope.

The oropharynx should be aspirated and an oropharyngeal airway introduced at once. A tightly fitted mask should be applied and the jaw supported in the forward position. A breathing machine is not essential. Positive pulmonary ventilation must be carried on by rhythmic pressure on the anesthetic bag at about 20 to 30 mm. of Hg at the rate of sixty times a minute. The lungs must be well inflated and well deflated during this period of forced respiration and mechanical breathing should go on until respiration is resumed.

Manual methods of artificial respiration are unsatisfactory. Respiratory stimulants should not be administered nor any oxygen mixture

containing CO_2, nor should the inexpert lose valuable time trying to pass an endotracheal tube.

Routine use of 50 to 75 mg. of ephedrine intramuscularly a few minutes before induction of spinal anesthesia is good prophylaxis for circulatory depression. Continuous intravenous drip of neosynephrine, 5 mg., in 500 cc. of normal saline provides for fine control and rapid administration if blood pressure should fall suddenly.

If cardiac asystole should follow respiratory failure, oxygen transport will not be possible. A slightly bent 3- to 5-inch needle may be passed into the right auricle through the third right intercostal space close to the sternum downward toward the midline. If all this should fail, cardiac massage may still save the patient's life. If the abdomen has not been opened for cesarean section, the bold obstetrician will make an incision in the fourth interspace from sternum to posterior axillary line, retract the ribs or cut the costal cartilages and massage the heart. The obstetrician will not find appeal to this dreadful court of last resort necessary if his spinal anesthesia is well considered and in good hands.

All inhalation anesthetics pass through the placenta and so endanger the baby. The dangers of induction are variable, yet they are always present. The disadvantages of volatile anesthetics may be briefly stated.

Ether will not please the patient. In the surgical plane it interferes with uterine contraction immediately after delivery of the baby and placenta and increases blood loss. Salivation and bronchial secretions are markedly increased favoring postoperative atelectasis. Gas, oxygen and ether sequence is more pleasant and safe if oxygen is given in sufficient concentration to prevent anoxia. Reflex excitability is apt to be high, so smooth induction may not be possible.

Cyclopropane, easily the most potent of anesthetic gases, perhaps should not be selected if only because of its high potency. It should be administered not only by a trained anesthetist but also by one familiar with its dangers. Although induction is rapid, cyclopropane will not give deep relaxation without deep third stage anesthesia. Cardiac irregularities not infrequently occur and the margin of safety is narrow. The baby is far more prone to develop asphyxia with nitrous oxide.

Chloroform is dangerous. Easy to take, induction is rapid, but steady slowing of the heart action with depth of anesthesia may result in cardiac standstill. Its use for more than fifteen minutes may result in liver damage.

Anesthesia for cesarean section carries a double burden—mother and baby. It should be effective, of course, for relief of pain, but first of all it should be safe. Local anesthesia is clearly the safest anesthetic and it can be made very satisfactory, yet it will not be found suitable for every patient nor for every obstetrician for that matter. It may be effective from beginning to end of the operation. If it should not be, intravenous sodium pentothal® drip 0.2 per cent will carry the patient through satisfactorily and safely.

Analgesia and anesthesia for pelvic delivery are no less important than for cesarean section. Analgesics may be used safely if administered with caution. As the patient approaches delivery, nitrous oxide and oxygen may be given with each contraction. Episiotomy and low forceps can be easily and satisfactorily accomplished under local anesthesia. Pudendal block, in expert hands, is excellent for delivery from mid-pelvis. Local anesthesia approaches the ideal. That only general anesthesia will be found suitable for some patients we fully recognize.

Although there is increasing interest in natural childbirth, most women ask that labor be shortened and the pains lessened. A woman does not need to take a series of lessons and exercises to lose her fear of childbirth. If she has confidence that her obstetrician will give her the best possible care, she will be happy. An obstetrician who does not inspire confidence and deserve it is not worth his salt.

Streamlined Articles

LOCAL TOXICITY OF A SULFAMYLON-STREPTOMYCIN MIXTURE WHEN INJECTED INTO TISSUE SURROUNDING TRAUMATIC WOUNDS

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THE authors report on sixteen cases in which a mixture of sulfamylon* and streptomycin was injected into the muscle and skin surrounding traumatic wounds No toxic effects of the drug were observed during the follow-up periods. Up to the time of the writing of this report sulfamylon and the sulfamylon-streptomycin mixture have been reported to be used clinically only as topical agents in the prevention of infection of traumatic wounds. From observation of wounds after the use of a mixture of sulfamylon and streptomycin it would appear that the mixture is without appreciable toxic effect upon the muscle and skin of patients with such wounds.

* * * *

Howes[1] reported on the tissue toxicity of sulfamylon when injected into the leg muscles of a rabbit as a 5 per cent solution and as a mixture containing streptomycin and sodium benzoate. No tissue reactions from the injections were noted after twenty-four, forty-eight and ninety-six hours and after one week.

This article deals with the experience at Hubbard Hospital with a series of sixteen cases in which a solution of the drug (mixed with streptomycin)† was injected into the tissues (muscle, skin) surrounding fresh wounds, as well as topically.

Clinical Material. The wounds were all fresh, ranging from small knife wounds to compound fractures with extensive lacerations of skin and muscles. The mixture was injected into the muscle and skin immediately surrounding the wound. The amounts of the mixture injected ranged from 2.0 to 70.0 cc. in the various cases. No other local anti-infective agent was employed. The cases, length of follow-up and amount of drug injected are shown in Table 1.

Results. The follow-up periods ranged from three to ninety-eight days. In all instances there was no evidence of wound infection, slough or other tissue reaction during the follow-up period. Of the fifteen cases followed up five days or longer, the wounds healed in the normal time as judged by clinical observation. The results of smear and culture of the wounds are recorded in nine of the sixteen cases. In one case no organisms were seen on the smear and there was no growth in the cultures.

COMMENT

Howes[2] has used the mixture topically in the prophylaxis of infection in open wounds. Others[3] have used sulfamylon in similar wounds.

When a solution is applied topically, the greater quantity of it runs off the wound and is lost to the tissues for which it was intended. Therefore, the knowledge that it can be injected into muscle and skin without significant tissue damage and without delay of wound healing is of some practical value. The type and amount of contaminating bacteria present in the wound have considerable effect upon wound healing. In this series the contaminating organism did not appreciably interfere with healing.

In this study the injected tissue was not observed microscopically. The results suggest,

* Sulfamylon: marfanil: mesudin: 4-amino-methyl-benzene sulfonamide.

† Contains sulfamylon, 5 per cent; streptomycin, 200 units per cc.; and sodium benzoate, ½ per cent.

however, that probably no important tissue damage occurs. This has been shown to be true in the case of rabbit muscle.

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Table I

Case No.	Smear and Culture Results	Type of Wound	Amount of Mixture in Cubic Centimeters	Days Follow-up	Results
I	Diplococci and staphylococci	Laceration of neck with hematoma	10	9	Healed per primam
II	No record	Laceration of scalp	5	10	Healed per primam
III	Aerobic streptococci	Laceration of hand	2	3	No infection or slough
IV	Staphylococci	Gunshot wound of right thigh	20	37	Healed without infection or slough
V	No record	Gunshot wound of left thigh with compound fracture of left femur	10	9	No infection or slough
VI	Gram positive diplococci	Cut extensor tendon of left index finger	Not recorded	21	Healed per primam
VII	No record	Shotgun wound of left shoulder	70	28	No slough; healed by granulation
VIII	Gram positive aerobic bacilli; staphylococci; diplococci	Shotgun wound of left hand with amputation of ring finger and fracture (compound) of middle finger	Not recorded	98	Healed by granulation; no infection or slough
IX	No record	Buzz saw amputation of second, third and fourth right fingers and distal on fifth of hand	10	26	Healed by granulation; no slough
X	Staphylocci; streptococci	Laceration of thenar eminence right hand	5	5	No infection or slough
XI	Culture and smear negative for organisms	Laceration of scalp; laceration of left shoulder	15 each	8	Healed per primam
XII	No record	Stab wound of left side of neck	Not recorded	12	Healed per primam
XIII	Gram positive bacilli	Compound fracture left tibia and fibula	Not recorded	28	No infection or slough
XIV	No record	Gunshot wound of abdomen and left shoulder	10 (shoulder)	12	Healed per primam
XV	Gram positive bacilli	Laceration of first and fifth metatarsals right foot	10	8	Healed per primam
XVI	No record	Knife laceration left thumb; partially severed flexor pollicus longus	5	14	Healed per primam

TESTOSTERONE PROPIONATE IN THE TREATMENT OF ECLAMPTIC TOXEMIA*

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IT has been proposed that excessive secretion of adrenocorticotropin (ACTH) or an increased ACTH effect is an essential part of the etiologic mechanism of eclampsia. Testosterone is a specific for both hypersecretion of ACTH and the undesirable results of an excess of ACTH. This suggests that testosterone should be useful in the treatment of eclamptic toxemia. Administration of testosterone propionate to two toxemic women was followed with marked improvement in their condition.

* * * *

Emotional and mechanical factors in certain individuals set up an alarm reaction during pregnancy.[4] An important feature of the response to alarm is overactivity of the anterior pituitary with hypersecretion of adrenocorticotropin (ACTH). Diets with excessive fat also may produce an increased ACTH effect.[5] It has been demonstrated that all of the anatomic lesions and most of the clinical findings characteristic of eclampsia could be reproduced in experimental animals or humans by administering cortical steroid hormones or through stimulation of the adrenal cortex with ACTH.[3] The term ACTH as used here refers to all anterior pituitary activity of which the adrenal cortex is the target.

Selye and his associates[2,8] have found that 11-desoxycorticosterone acetate (DCA) when given to unilaterally nephrectomized rats maintained on a high NaCl intake results in the rapid development of kidney lesions which they characterize as nephrosclerosis. These lesions are apparently identical to those seen in women who have recovered from eclampsia.[6] It was noted that non-castrate male rats subjected to this treatment were far less apt to develop severe renal damage than were females or castrate males. These investigators also showed that administration of testosterone derivatives furnished a high degree of protection against DCA poisoning.[9] According to Selye testosterone has a renotropic action.[7]

Teabeaut et al.,[10] Bartter[1] and others have used testosterone derivatives with satisfactory results in the treatment of Cushing's syndrome, a condition characterized by hypersecretion of adrenal cortical hormones. Bartter and his group believe that testosterone inhibits production of ACTH.

If hypersecretion of ACTH is a factor in the etiology of pregnancy toxemia, it appears that testosterone should be effective in its treatment. The following is a report on the use of testosterone propionate in the treatment of a case of preeclampsia and another of eclampsia.

CASE REPORTS

CASE 1. A forty-one year old multipara when nine weeks before term was found to have edema, albuminuria (1-plus) and blood pressure of 164/102. The usual treatments produced no apparent benefit. Estrone in 2 mg. doses was ineffective. Testosterone propionate, 25 mg. in oil, was administered intramuscularly. Twenty-four hours later the blood pressure was 140/86 and remained at about this level for four days. On the fifth day it was 162/106. A second testosterone injection again was followed with depression of the blood pressure which continued for about four days. The treatment was given five times in all with the same drop in blood pressure noted each time.

There was little correlation between the edema and albuminuria and the blood pressure. During treatment the patient sometimes would have albuminuria when the blood pressure was down and none when it was up. The edema also was variable. Following the fifth testosterone injection a cesarean section was performed while the blood pressure was depressed, the indication being a contracted pelvis. Recovery was uneventful.

In this patient the benefit from testosterone treatment lasted four to five days. It is interesting to note that Venning and Browne[11] found testosterone propionate or methyltestosterone administered to humans caused a lowering of urinary glycogenic corticosteroid excretion.

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Seven days after cessation of treatment the corticosteroid excretion had returned to normal.

CASE II. A primigravida, age nineteen, when three weeks before term suffered a sudden, sharp, abdominal pain which as it later developed apparently signified a practically complete separation of the placenta. On admission to the hospital one hour later the patient appeared ill. There were occasional weak uterine contractions which continued intermittently. Blood pressure on admission was 158/104 but there was no edema. Over a period of four hours evidence of severe toxemia developed and gradually the patient went into a coma. There were no convulsions.

At this time the blood pressure was 170/120 and there were bulging subconjunctival hemorrhages. Urine showed 4 plus albumin. The patient was given 50 mg. testosterone propionate and a large dose of B vitamins. Intravenous glucose was administered. Following treatment the patient showed gradual improvement over a period of eight hours. At the end of this time she responded to questions, although her mentality was still clouded. Blood pressure went down to 146/88. Her vision was blurred.

During the following twelve hours her condition gradually became worse. The blood pressure rose slightly to 152/98 and there was a rapid pulse, 128. Urine production dropped to 90 cc. in twelve hours. Blood uric acid was 6.7 mg. per cent. A cesarean section was performed not in the sense of an obstetrical procedure but rather as an operation to remove an offending tumor.

The placenta was found to be separated completely except for a segment of the rim. The uterus contained an estimated 400 to 500 cc. of blood. Uterine tissue was extremely friable; and although the incision was adequate and delivery easy, removal of the baby resulted in a large rent extending upward across the fundus.

The patient's condition was definitely worse following operation (stress). She was stuporous and there were retinal hemorrhages which limited vision to perception of light. Only 5 to 10 cc. of urine (bloody) entered the bladder in two hours. Respiration was labored. More glucose was given with the general picture showing little change. Eight hours following operation the patient received a second 50 mg. dose of testosterone propionate. Within the next several hours definite mental and physical improvement was noted. Urine began to drain from the indwelling catheter. The gross blood disappeared and the urine color changed to cloudy brown. The patient was able to converse freely and spoke of a feeling of relief.

The testosterone treatment was repeated the next day. The patient made a good recovery with no evidence of residual kidney damage. Return of vision was gradual. Two weeks following delivery there was generalized jaundice of moderate degree which cleared up over a period of three weeks with treatment consisting of liver extract, methionine and vitamins.

Caution was observed in giving testosterone to these patients. The author believes that in the second case (eclampsia) larger amounts of the drug would have been beneficial. Further observations will be needed to determine optimum dosage, but it must be kept in mind that large doses of testosterone may cause masculinization.

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Case Reports

NON-INFECTIOUS GRANULOMA

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THIS case is reported for the purpose of bringing to the attention of the reader an unusual site for non-infectious granuloma simulating a destructive lesion of bone. This tumor is also called xanthoma or giant cell tumor of tendon sheath by some observers.

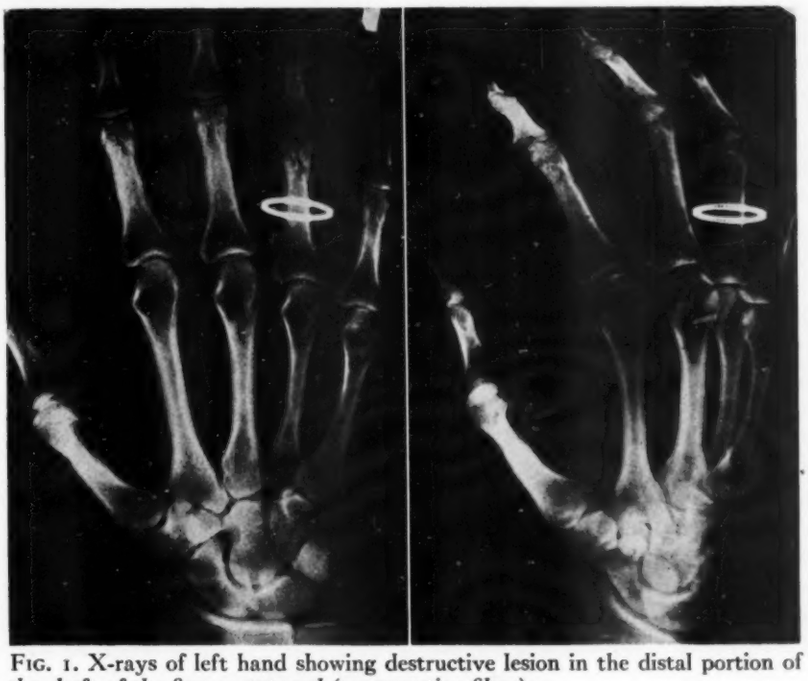

FIG. 1. X-rays of left hand showing destructive lesion in the distal portion of the shaft of the first metatarsal (preoperative films).

The nature of these lesions has been a subject of much controversy. They have been described as true neoplasms, as a reaction to local trauma or infection, as an inflammatory lesion or as a disturbance of cholesterol metabolism.

The origin of this lesion has been well examined by others. Geschickter and Copeland[1] have suggested that these tumors may arise or have some relationship to aberrant sesamoid bone. Coley,[2] Willis[3] and many others perceive that this tumor arises from the synovial tissue of the tendon sheath. Coley[2] points out that rarely does one find alterations in the bone adjacent to the tumor and in such instances when this occurs a periosteal fibrosarcoma might be suspected. The case presented herein aroused such suspicion.

CASE REPORT

The patient, a thirty-five year old white housewife, was admitted to the hospital with the common complaint of "a tumor of the thumb." The patient gave the history of a swelling on the dorsal aspect of the left first metacarpal of one month's duration. A questionable history of trauma existed. Sub-

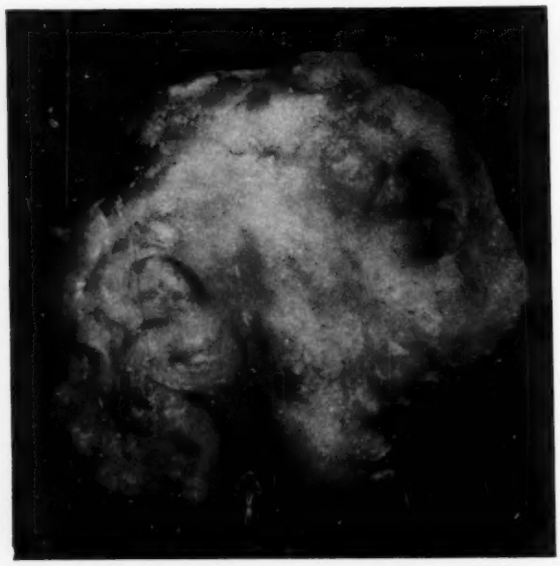

FIG. 2. Gross specimen demonstrating the groove which was occupied by the extensor pollicus longus tendon; specimen measured 3 by 2 by 1 cm.

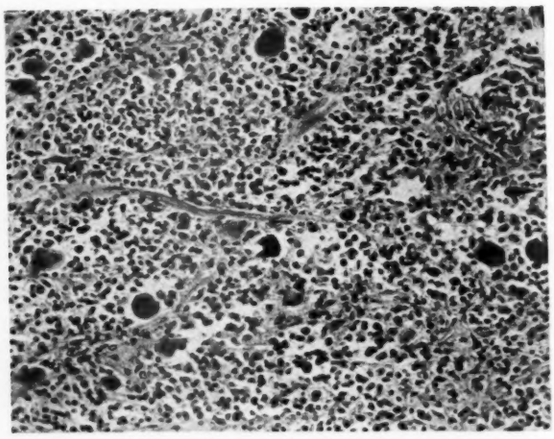

FIG. 3. Photomicrograph of specimen. 200 ×.

4A 4B

FIG. 4. A and B, x-rays taken one and a half years postoperatively demonstrating some repair of the bony defect.

sequently the patient noted the mass and sought medical advice. At this time x-rays were taken. The roentgenologist reported a destructive lesion of the first metacarpal. (Fig. 1.) In the interim between the x-rays and her admission to the hospital the patient stated that the mass had increased somewhat in size. Her past history, family history and systemic reviews were negative.

Physical examination revealed no abnormalities other than local findings in the left hand. The mass was a discrete, well circumscribed tumor presenting on the dorsal aspect of the first metacarpal. The tumor was not tender or painful, nor was there evidence of inflammation. The skin was not adherent to the tumor and the tumor was not firmly attached to the metacarpal. There was no evidence of lymphatic extension in the anticubital fossa or the axilla.

Laboratory studies were as follows: red blood cells 3,990,000, white blood cells 7,100, hemoglobin 12 gm., blood sugar 73 mg. per 100 cc., uric acid 3.2 mg. per 100 cc., calcium 9.4 mg. per 100 cc., phosphorous 3.3 mg. per 100 cc., alkaline phosphatase 3.2 Bodansky units, urine negative and serology negative.

At operation the tumor was approached through a dorsal incision in the web space between the first and second metacarpals. It was found interposed between the extensor pollicus longus tendon and the shaft of the first metacarpal, and apparently arose from the tendon sheath. A groove was present in the tumor; occupying this was the long extensor tendon of the thumb. The metacarpal presented a defect which was apparently due to pressure erosion, and not to invasion of the bone by the tumor.

The tumor was excised completely, after which there was no evidence of local invasion of the bone or tendon sheath. The patient's postoperative course was uneventful. The

wound healed by primary union and she was discharged on the eighth postoperative day.

The excised tumor was a bisected nodular mass measuring 3 by 2 by 1 cm. whose external surface was smooth, glistening and gray, and the cut surface was tannish gray and homogenous. (Fig. 2.)

The sectioned specimen demonstrated an irregular lobulated tissue composed of large numbers of large mononuclear phagocytic cells and foreign body type giant cells. The phagocytic cells are seen in various degrees of fusion. Mitotic division figures can be seen. The fibroblasts demonstrate a tendency to form interlobular septa. Both within the septa and to a lesser degree among the phagocytic cells are deposits of hemosiderin pigment. Local collections of cholesterol crystals are indicated by characteristic spaces and nearby masses of foamy, vacuolated, large mononuclear cells. (Fig. 3.) The pathologic diagnosis was chronic non-infectious granuloma.

The patient was asked to return on January 29, 1950, for re-examination. The wound was found well healed, with a small, non-tender, movable scar. The patient had no complaints referable to this hand since she was discharged from the hospital.

X-rays made at this time demonstrated a remaining erosive defect in the dorsal medial aspect of the distal shaft of the first metacarpal. There was evidence of old periosteal reaction below the defect and on the opposite side. No soft tissue masses were present and there was no evidence to suggest any progressive bone destruction. However, to the contrary, some evidence of bone healing was present. (Fig. 4.)

CONCLUSION

A case of an unusually large example of an uncommon tumor has been presented. The location of this tumor was somewhat unique in that it arose from the extensor pollicus longus tendon, with adjacent bone changes in the first metacarpal.

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INFANTILE CORTICAL HYPEROSTOSES*

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INFANTILE cortical hyperostoses or Caffey's disease is a relatively rare syndrome usually developing within the first six months of life and characterized by marked soft tissue swelling, cortical thickening with periostitis and irregular new bone formation of a self-limited duration. The cause of the disease is at present unknown but the clinical and x-ray findings have been quite consistent involving both flat and long bones.

The first case was reported by Caffey[1] in 1939. The report by Caffey and Silverman[2] of four cases in 1945 also included this first case. Caffey[3] then reported six additional cases in 1946 thus giving the most comprehensive study of the disease to date. Smyth, Potter and Silverman[7] reported seven similar cases in 1946. Other cases have been reported by Dickson, Luckey and Logan,[4] Whipple,[8] Fisk[5] and Shuman.[6]

CASE REPORTS

CASE 1. W. W., a Negro male infant aged two months, was admitted to the University of Pennsylvania Hospital on August 5, 1948, with the chief complaint of fretfulness and poor feeding of three days' duration. Three days prior to admission the patient began to cry a good deal at night and fret during the day. He would salivate a great deal and spit back or regurgitate a small amount of his food. He had no diarrhea, vomiting, fever or apparent pain. His mother had noticed the asymmetry of his face but was not impressed by it.

Family history was non-contributory.

Past medical history revealed that the patient was delivered with the aid of forceps. There were no obstetrical or neonatal complications. The patient's birth weight was 7 pounds, 4 ounces. The patient was breast-fed initially but was placed on an adequate formula at the time of discharge. There was a change of formula at the age of one month due to a short bout of diarrhea.

Physical examination on admission disclosed a well developed and well nourished Negro child who was fretful and irritable. There were no skin rashes or lesions. There was a single, hard, anterior cervical gland just below the angle of the right mandible. The head was asymmetrical. There was a firm mass (3 by 3 cm.) continuous with the right mandible that was not inflamed but was apparently tender. The child did not appear to swallow well. His chest was clear, his heart was normal and his abdomen was negative except for a walnut-sized umbilical hernia. No detectable neurologic abnormalities were present.

Laboratory studies revealed normal urinalysis and negative blood Wassermann reaction. The hemoglobin was 60 per cent; white blood count ranged between 9,500 and 17,000 with a normal differential. Hematocrit was 30, reticulocyte count 3.6 per cent, and no evidence of sickling existed. A tuberculin test was done and found to be negative. The roentgenogram of the right mandible taken at the time of admission revealed a demineralization of the surrounding bone with a destructive process at the angle. (Fig. 1A.)

At the time of admission the patient was started on penicillin, 25,000 units every eight hours, and by the second hospital day the soft tissue swelling around the mass in the mandible had diminished noticeably. He became less irritable, ate well and up until the last week of hospitalization gained weight satisfactorily. On the twenty-first hospital day it was noted that the child had a swelling of the right forearm that was not present at the time of admission. This swelling was not warm but apparently quite tender. The roentgenogram of the right arm taken on the twenty-fifth hospital day showed a periostitis involving the entire diaphysis of the ulna and the distal third of the diaphysis of the right humerus. (Fig. 1C.) These changes were not present in the x-ray taken at the time of admission. (Fig. 1B.)

The patient was discharged on September 1,

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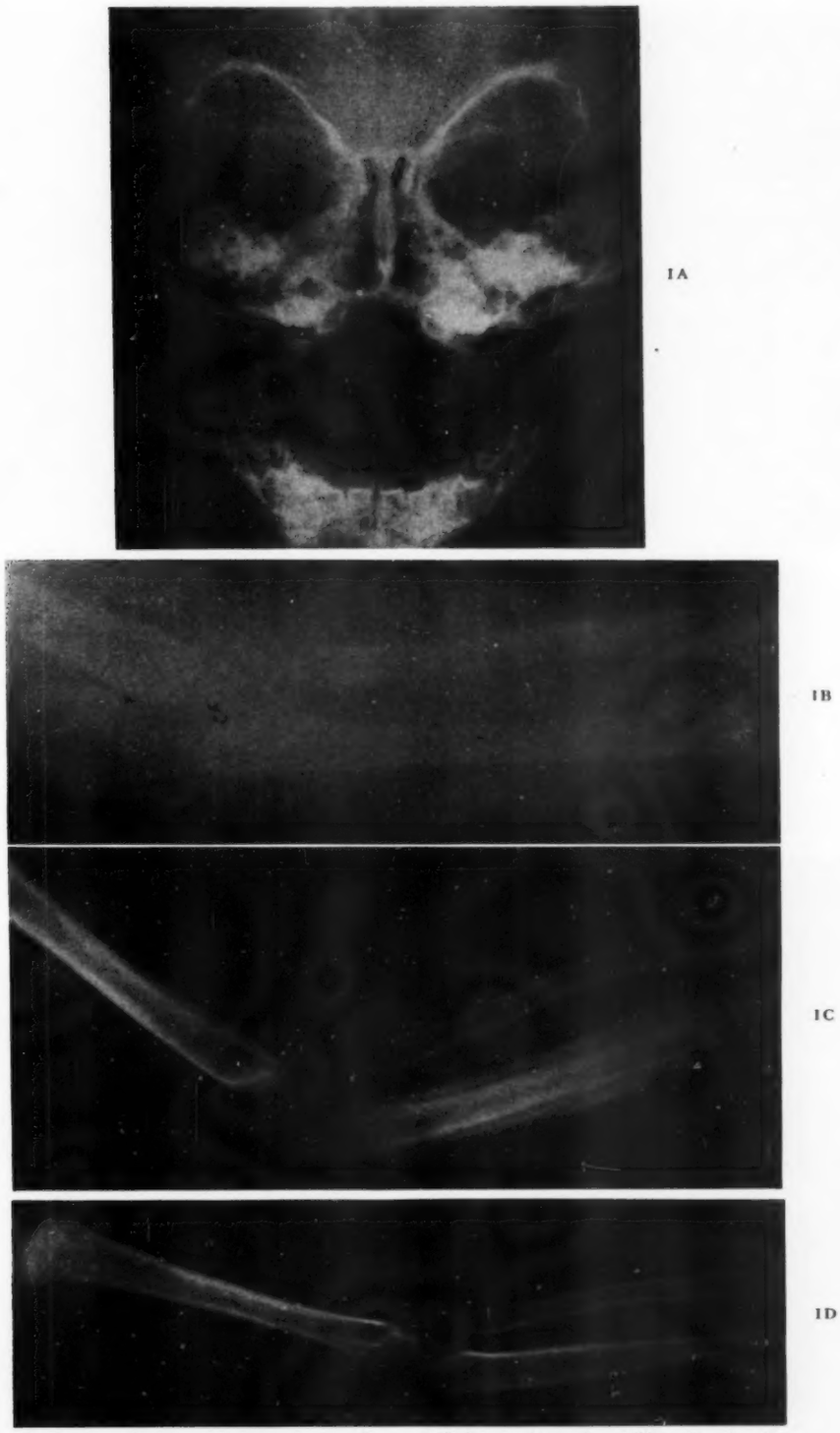
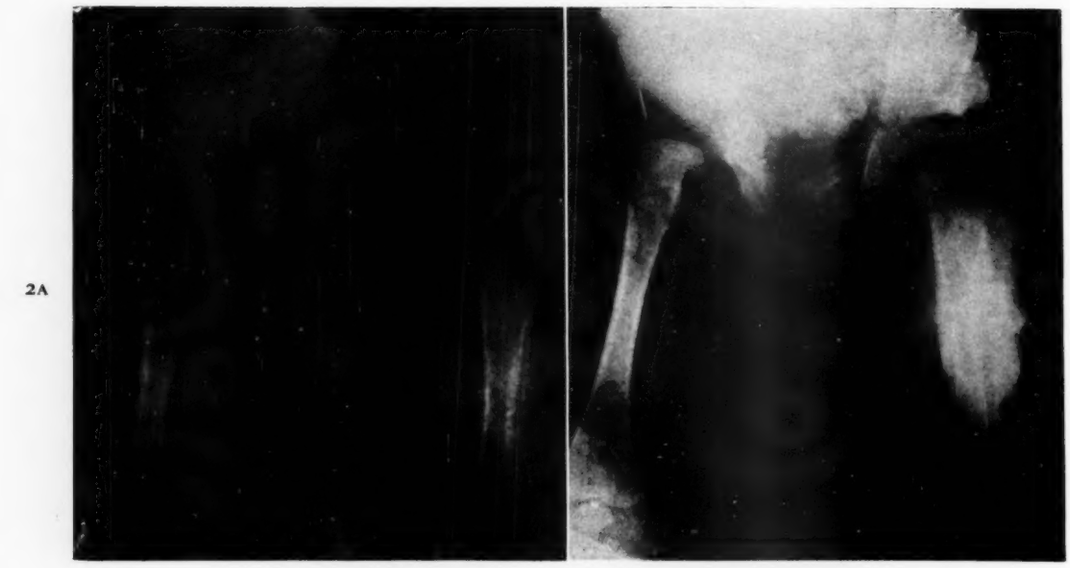


FIG. 1. A, Case 1, roentgenogram shows definite periosteal proliferation in the angle of the right mandible with demineralization of the surrounding bone; B, roentgenogram of the bones of the right arm taken at the time of admission shows no abnormalities; C, roentgenogram of the right arm taken on the twenty-fifth hospital day shows a periostitis involving the entire diaphysis of the ulna and the distal third of the diaphysis of the humerus; D, bones of the right arm show no abnormalities six months later. (Compare with Fig. 1C.)



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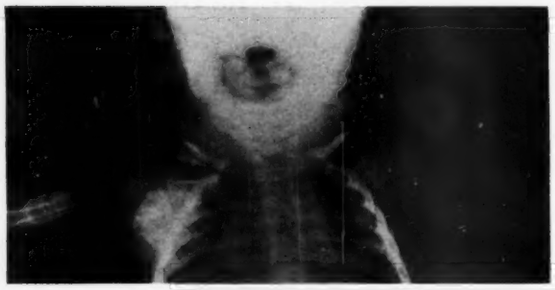

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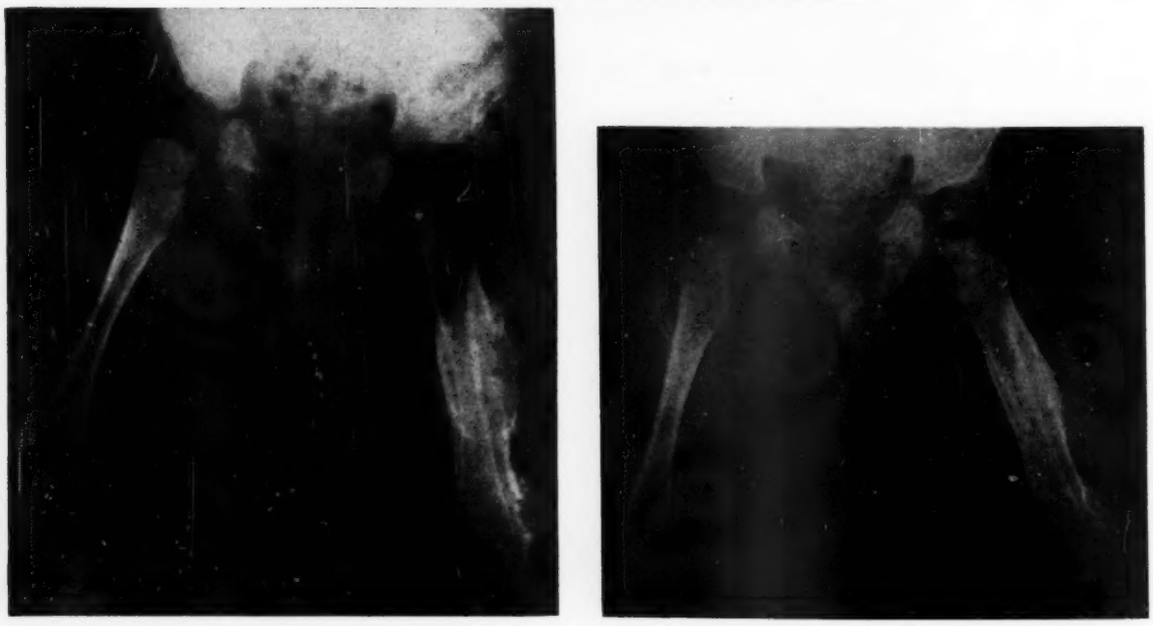


2D 2E

FIG. 2. A, Case II, involvement of the middle third of the shaft of the left femur with marked periosteal reaction; B, marked changes involving the left femur and the left ilium eleven days later; C, bone survey reveals soft tissue swelling, cortical thickening, periostitis and irregular new bone proliferation involving the right scapula, right clavicle, right humerus, left ulna and right side of mandible; several of the ribs show periosteal proliferation;

2F

2G

2H

D, the long bones show slightly increased density in the involved areas of the pelvis and the left femur; E, a definite decrease in the periosteal proliferation in the left femur became evident; F, three months after bone survey x-rays show normal right scapula and right humerus. (Compare with Fig. 2C.) G, roentgenogram of the left ulna reveals that the hyperostosis has completely disappeared; H, follow-up x-ray shows a normal pelvis and a left femur that is well on its way to recovery.

1948, and was followed in the outpatient department. At the time of discharge the swelling in the region of the mandible had diminished but there was a tender, bony, soft tissue enlargement of the right forearm. There was no evidence of any focus of infection and the child was afebrile.

X-rays taken on March 22, 1949, showed no definite periosteal proliferation in the angle of the right mandible. X-rays of the long bones showed no abnormalities. (Fig. 1D.)

CASE II. R. A., a white male infant, was first seen at this hospital at the age of thirteen weeks because of swelling of the left thigh of some three weeks' duration. The patient had been placed on adequate formula feedings since birth. There were no illnesses prior to the present complaint. At about the age of ten weeks the mother first noticed that the patient was unable to extend the left knee more than 90 degrees.

Physical examination revealed the patient to be in good general condition. Examination of the lower extremities revealed no areas of increased local heat. The left knee was flexed and could not be passively extended beyond 90 degrees. On palpation there was a dense mass which seemed to be somewhat tender and which extended from the upper femoral region down to the knee. The mass was limited to the shaft of the femur and did not extend into the knee or hip joints.

Laboratory studies revealed normal urinalysis and negative blood Wassermann reaction. The hemoglobin was 75 per cent; red blood count, 3,920,000; color index, 1.01; white blood count, 13,000; polymorphonuclears, 38 per cent; lymphocytes, 54 per cent; monocytes, 4 per cent; eosinophils, 2 per cent; basophils, 2 per cent; bleeding time, seven minutes; coagulation time, four and a half minutes and platelet count, 187,000 per cu. mm.

X-rays taken on July 28, 1949, showed involvement of the middle third of the shaft of the femur with marked periosteal reaction. (Fig. 2A.) A bone survey was done on August 8, 1949, revealing well developed bone changes involving the left femur, the left ilium (Fig. 2B), the right scapula, the right clavicle, the right humerus, the left ulna and probably the right side of the mandible. (Fig. 2C.) These films were characterized by marked soft tissue swelling, cortical thickening limited to the shaft of the bone, periostitis and irregular new bone proliferation. It was noteworthy that many of the ribs contained periosteal new bone proliferation. The epiphyses and cartilage of the joints were all normal.

In x-rays taken on August 22, 1949, the appearance of the long bones revealed a little more increased density of the hyperostotic areas in the pelvis and the left femur. (Fig. 2D.) Clinically, however, there was definite improvement. The bone mass in the left thigh felt smaller and the patient was able to extend his left knee almost to its full extent. X-rays taken on September 21, 1949, showed the bone lesions to be smaller and sharply demarcated. (Fig. 2E.) These findings were consistent with the patient's clinical course. The patient had recovered normal function of the left knee and was in excellent general condition.

X-rays taken on November 8, 1949, showed that the hyperostosis of the right scapula and right humerus (Fig. 2F) and left ulna (Fig. 2G) had completely disappeared. X-rays taken on December 21, 1949, showed the following: (1) the pelvis now had a normal appearance and (2) the hyperostosis of the left femur was still present but less exaggerated. (Fig. 2H.)

CASE III. H. L. P., a white female infant, was admitted to the Children's Hospital of Philadelphia on June 5, 1949, at the age of three and a half months with the chief complaint of puffiness of the eyes.

The patient was a full term delivery. The child was noted to have slight puffiness of the eyes soon after birth. She did well until the age of six weeks when rather marked puffiness of the eyes developed. She was treated symptomatically without improvement. In the early part of May, 1949, her mother noticed swelling over the right maxilla and mandible. Swelling of the right mandible and maxilla was noted to be more marked toward the end of the day at which time the child was more irritable. The dietary history revealed that the child had eaten no eggs, meat or other iron-containing foods.

Family history was non-contributory.

Physical examination on admission revealed the following positive findings: A fullness was present over the right mandible just anterior to the angle of the jaw which was quite obvious when the mandible was palpated with the index finger in the mouth. A moderate perorbital edema existed, more marked on the

right with injection of the conjunctivas. There was a slight mucoid nasal discharge. There was a small umbilical hernia. The liver was palpable three fingerbreadths below the right costal margin in the mid-clavicular line.

Laboratory studies revealed normal urinalysis and negative Kline test. The hemoglobin was 65 per cent; red blood count, 3,140,000; non-protein nitrogen, 30 mg. per cent; phosphorus, 610 mg. per cent; phosphatase, 16.2 Bodansky units. A tuberculin test was done and found to be negative. Bone marrow biopsy revealed the marrow to be very cellular and changes were not due to dilution with blood. There was a marked increase in mature lymphocytes with either a relative or absolute decrease in granulocytes and normoblasts.

X-rays of the mandible, maxilla, long bones, shoulders, chest and orbits were done. Examination of the orbits showed no evidence of any pathologic condition. Examination showed definite periosteal proliferation along the lower border of the middle one-third of each clavicle. (Fig. 3.)

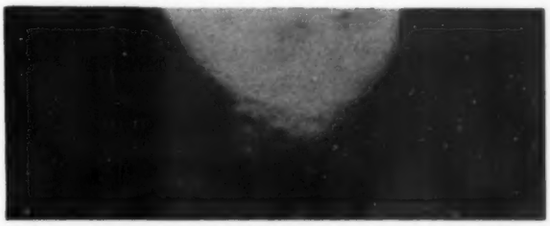


FIG. 3. Case III, roentgenogram reveals definite periosteal proliferation along the lower border of the middle one-third of each clavicle.

CASE IV. M. F., a white female infant, was admitted to the Children's Hospital of Philadelphia on June 28, 1949, at the age of six months with the chief complaint of irritability and persistent crying.

The patient was born three weeks before term. Pregnancy was essentially normal and there was no jaundice or cyanosis in the newborn period. The mother stated that during the first trimester she sprayed the house frequently with 5 per cent D.D.T.

The patient was well for the first month of her life. Her diet had always been adequate and vitamin supplements were added to the diet at the age of two weeks. At the age of one month she became exceedingly irritable, cried constantly while awake and could not be calmed. In April, 1949, her father noticed swelling and induration of her left arm and left leg.

Family history was non-contributory.

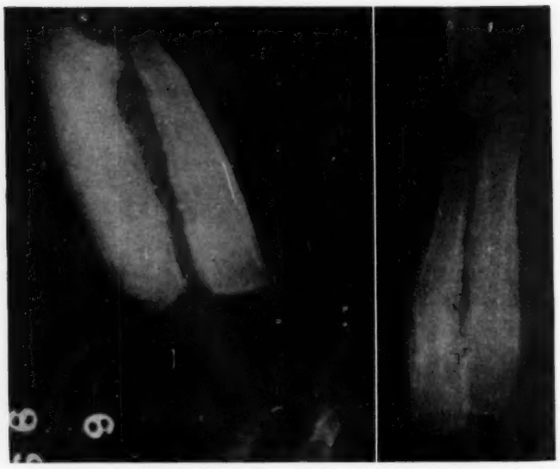
Physical examination on admission revealed a pale, extremely irritable child. There was marked swelling of the mandibles which resulted in marked distortion of the facial features. There was also thickening and swelling of both forearms which were bony, hard and tender. There was similar involvement of the left tibia. The ribs were markedly hard and less resilient than is normally the case in babies of this age. Examination of the heart revealed the presence of a loud, systolic murmur; however, the heart was not enlarged to percussion.

Laboratory studies revealed normal urinalysis and negative serologic test for syphilis. The hemoglobin was 9 gm. per cent; red blood count, 3,700,000; white blood count, 14,800; neutrophils, 26 per cent; lymphocytes, 65 per cent; monocytes, 1 per cent; eosinophils, 6 per cent; basophils, 2 per cent; bleeding time, three minutes; coagulation time, four minutes; platelet count, 350,000 per cu. mm.; serum calcium, 11.1 mg. per cent; serum phosphorus, 5.4 mg. per cent; phosphatase, 24 Bodansky units and sedimentation rate, 30 mm. per hour. A tuberculin test was done and was found to be negative. An electrocardiogram was done and was within normal limits.

X-rays taken on June 29, 1949, revealed a marked generalized periosteal proliferation and cortical thickening, extremely so in the left radius and left ulna. (Fig. 4A and B.) Marked involvement of the left tibia was also present. (Fig. 4C.) There were no definite areas of bone destruction. Marked periosteal proliferation was present involving all the ribs, both clavicles and scapulas. The mandible also showed a moderate amount of periosteal reaction.

CASE V. R. H., a white male infant, was admitted to the Children's Hospital of Philadelphia on March 4, 1947, at the age of five months with the chief complaint of swollen left side of jaw.

The patient was a normal full term delivery. The weight at birth was 8 pounds, 3 ounces. The child had a moderate amount of jaundice which lasted for five days after birth. The patient was breast-fed for the first eight days and then placed on formula due to lack of breast milk.



4A 4B

4C

FIG. 4. A and B, Case IV, marked generalized periosteal proliferation and cortical thickening of the left radius and left ulna; C, marked involvement of the left tibia but no definite areas of bone destruction.

At the age of one month the mother noticed that the left side of the patient's jaw was larger than the right side. This gradually increased until at the age of four months he was admitted to another hospital and treated with penicillin for eight days. At about this time it was noticed that the chin was swollen and the right side of the mandible was also enlarged.

Family history revealed that one great-grandfather had skin cancer, and one great-grandmother had cancer of the breast.

Physical examination on admission revealed a five-month old boy with marked swelling of both mandibles. The rest of the physical examination was negative.

Laboratory studies revealed a faint trace of albuminuria and negative Kolmer and Kahn tests. The hemoglobin was 72 per cent; red blood count, 3,900,000; white blood count, 9,400; neutrophils, 51 per cent; lymphocytes, 45 per cent; monocytes, 4 per cent; non-protein nitrogen, 19 mg. per cent; serum calcium, 9.6 mg. per cent; serum phosphorus, 8.6 mg. per cent; phosphatase, 21.2 Bodansky units and ascorbic acid plasma level, 0.8 mg. per cent.

X-rays taken on March 5, 1947, revealed periosteal proliferation of the inferior borders of both mandibles. Examination of the long bones and skull including the ribs, scapulas and clavicles was essentially negative.

SUMMARY

In all of the cases presented herein the disease occurred within the first six months of life. In Case V a definite swelling of the left side of the mandible was noted within the first month of life.

Hyperirritability, swelling and tenderness are important clinical manifestations of this disease. The syndrome appears to be a self-limited manifestation of multiple cortical hyperostoses accompanied with a moderate leukocytosis with temperature rise some-time during the acute phase. Usually more than one area of the body was involved.

The family and maternal histories were all non-contributory. The pregnancies were normal with no history of any unusual complication at the time of birth.

The x-ray findings were quite consistent. They usually showed definite periosteal proliferation, marked soft tissue swelling and later irregular new bone formation. It is very interesting to note in Case I that periostitis involving the right ulna and the right humerus developed during the patient's stay in the hospital. (Figs. 1A, 1B and 1C.) In Case II the x-ray findings are very instructive, correlating closely with the patient's clinical course. As the patient's symptoms decreased, the x-ray findings also showed definite improvement.

Laboratory studies were of significance only in ruling out other known diseases. All serologic tests for syphilis were negative.

In the differential diagnosis syphilis, trauma, scurvy, infection and neoplasm should be considered but the characteristic features of the syndrome, infantile cortical hyperostosis, appear to be distinct from any of these. To date no etiologic factor has been proven as causing the condition. Caffey and Silverman[2] suggest the possibility of this syndrome being a subperiosteal allergic edema. To consider

that this temporary osseous response resembles those cases with temporary soft tissue edema as in angioneurotic edema is an interesting concept and one that is worthy of further consideration. Also, there may be a disturbance of the normal immunity which the infant possesses during the first year of life permitting the development of these osseous changes.

It is curious that this clinical entity has not been found reported before Caffey's[1] original article in 1939, for in both orthopedic and pediatric practice the syndrome must have been previously observed.

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Amebic abscess in the liver occasionally develops as a complication in patients with amebic dysentery. Emetine therapy is so successful that very few of these abscesses will require surgical drainage. However, if in these patients with hepatic abscess pleuropulmonary complications also develop, then radical surgery is usually advisable. If the lung is firmly bound down and cannot re-expand, or if a bronchobiliary fistula persists, in spite of energetic medical treatment, radical surgery is needed. It is best to excise the pathologic lung tissue rather than simply to incise and drain it. (*Richard A. Leonardo, M.D.*)

TRAUMATIC CYST OF THE SPLEEN*

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COL. JAMES H. FORSEE, M.C.
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POST-TRAUMATIC cyst of the spleen is relatively uncommon. Fowler was able to collect only 137 reported cases of non-parasitic splenic cysts up to January 1, 1939.[1-3] McClure and Altemeier collected eleven more reported cases up to February, 1941, a total of 148.[3] An additional case report of a large, solitary, post-traumatic cyst of the spleen is reported.

Several classifications of splenic cysts have been offered. The one given by McClure and Altemeier[3] is excellent. (Table 1.) A definite, specific, secreting lining which may be epithelial, endothelial or parasitic is considered a true cyst of the spleen, while false cyst walls have no such lining and are composed of fibrous tissue, irregular necrotic splenic tissue or a layer of compressed splenic parenchyma.

TABLE 1
CYSTS OF THE SPLEEN*

I. True Cysts—lined by specific secreting membrane:
  A. Epithelial:
    1. Dermoid
    2. Epidermoid
  B. Endothelial:
    1. Lymphangioma
    2. Hemangioma
    3. Polycystic disease
    4. Some serous cysts
  C. Parasitic—lined by protoplasmic matrix containing numerous nuclei:
    1. Hydatid cyst caused by ecchinococcus
II. False cysts—no specific secreting lining:
  A. Hemorrhagic
  B. Serous
  C. Inflammatory
    1. Acute necrosis in infection
    2. Chronic tuberculosis
  D. Degenerative liquefaction of infarcted areas caused by embolism or arterial thrombosis.

* MCCLURE, ROY D. and ALTEMEIER, W. A. *Ann Surg.*, 116: 98, 1942.

CASE REPORT

A twenty-four year old Staff Sergeant of Mexican parentage was admitted to the Orthopedic Service, Fitzsimons General Hospital, on August 2, 1947, for treatment of a simple fracture, right humerus, sustained on July 30, 1947, when the automobile in which he was driving was forced off the road. He was not aware of any abdominal or chest injury at the time of the accident. On the day of admission he noted vague epigastric discomfort. There was no accompanying anorexia, nausea or vomiting, and physical examination of the abdomen revealed no abnormal findings.

On October 1, 1947, he first complained of left upper quadrant discomfort manifested by dull pain and excessive flatus. At this time there was an ill-defined mass in the left upper quadrant extending a fingerbreadth below the costal margin. Gastric tympani was noted to be displaced to the right. There was no nausea, vomiting, hematemesis or melena. He had never served in the tropics and there had been no abnormal bleeding tendencies, jaundice or any chronic infectious diseases such as malaria. The patient did not appear acutely or chronically ill when seen by the authors on October 18th. A definite fullness was visible and palpable over the anterior left lower chest and left upper quadrant of the abdomen. The left leaf of diaphragm was elevated but moved well with respiration. The firm, slightly tender mass in the left upper quadrant had increased in size toward the midline and extended three fingerbreadths below the costal margin. No other solid organs were palpable. A tentative diagnosis of traumatic injury to the spleen or a pancreatic cyst was made.

The erythrocyte and leukocyte blood count was within normal limits. Hemoglobin was 13 gm. per cent, hematocrit 40 per cent, Kahn test negative, sedimentation rate 1/60 (Wintrobe), non-protein nitrogen 40, fasting blood sugar 111, total serum protein 7.3 (albumin 5.0, globulin 2.3), agglutinations for Eberthella typhosa, Salmonella paratyphi, Salmonella schottmülleri, undulant fever and heterophile antibodies negative, reticulocytes 0.9 per cent, thrombocytes 246,000, clotting time four

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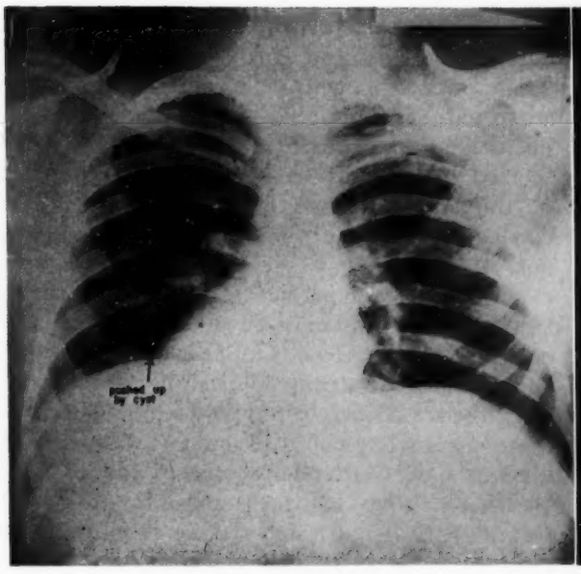

1

2

FIG. 1. Roentgenogram of chest eleven weeks after automobile accident.
FIG. 2. Roentgenogram (gastrointestinal series, October 10, 1947) showing a large, dense mass in the left upper quadrant of the abdomen displacing stomach and small intestines to right of midline.

minutes, bleeding time one and a half minutes, prothrombin level 100 per cent of normal, repeated urinalyses were negative and blood amylase 8 units. Study of sternal bone marrow on October 18, 1947, revealed normal morphology of cells as well as normal percentage distribution.

X-ray findings of the chest are illustrated in Figure 1. On September 25, 1947, examination of the abdomen (supine and upright) revealed there was no evidence of gas in the small bowel. There was a fairly discrete area of homogenous increased density noted in the left upper quadrant below the diaphragm. There was no definite kidney shadow on the left side. (Fig. 2.) On October 10th the upper gastrointestinal series revealed there was no disorder in the esophagus. The stomach filled well but was displaced to the right. Examination of the stomach, pylorus and duodenum proved negative. Films taken at intervals, after barium swallow, showed the small bowel was also to the right of the midline. The lateral view showed the stomach to be displaced anteriorly. The upper pole of the left kidney could be seen through the shadow, thus tending to rule out the possibility of this being a kidney change. Pancreatic cyst, enlarged spleen and retroperitoneal sarcoma were possibilities. On October 13th the excretory urogram showed the left kidney shadow was displaced inferiorly and was separate from the large mass in the left upper quadrant. There was evidence of function bilaterally.

In evaluating all findings it was evident that exploratory laparotomy would be required to determine the true nature of this mass. On October 31st exploratory laparotomy was performed. On opening the peritoneum a large adherent mass was visible in the left upper quadrant which appeared to be cystic. Approximately 4,000 cc. of thin, odorless, greenish gray colored fluid with flecks of necrotic tissue were evacuated and the cystic mass opened. Separation of the cyst wall from the diaphragm was a difficult and tedious procedure as dense adhesions were present. The medial surface of the mass was densely adherent to the tail of the pancreas, and the distal 2 inches of the pancreas was removed with the cyst. On the posterior surface of the cystic mass under cover of the diaphragm was a small 3 by 4 by 3 cm. piece of splenic tissue. The splenic artery and vein were doubly ligated; the cystic mass and spleen were removed.

The pathologic report was as follows: Grossly the specimen weighed 660 gm., after contents of cyst had been evacuated at operation. The specimen appeared to be a collapsed cyst and the tail of the pancreas was tightly applied to the cyst. Along what appeared to have been the posterior surface of the cyst there was an

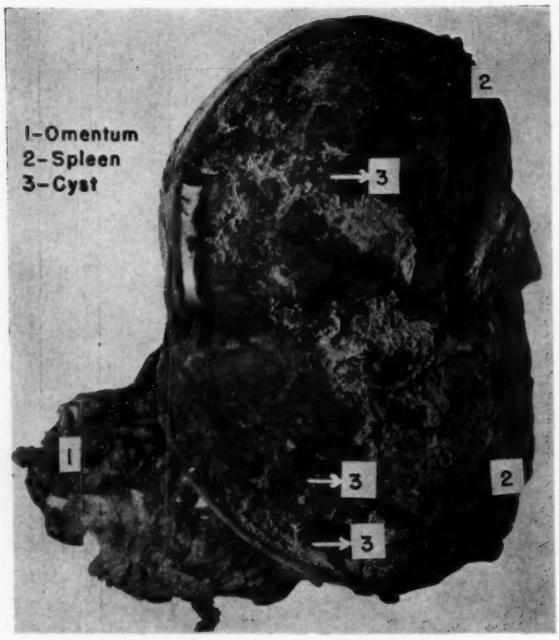

FIG. 3. Illustration of splenic cyst.

elongated conical-shaped structure which on cut section was dark purplish and was considered at first to be an accessory spleen flattened by the pressure of cyst. This was the only splenic tissue present and from its appearance it was all that remained of the spleen, the cyst having replaced the rest of that organ. The cyst lining was pale grayish red, glairy, finely furrowed, with shallow "moth eaten" pitting. The gross impression was cystic destruction of the spleen following trauma and hemorrhage. (Fig. 3.)

The cyst wall was composed of fibrous tissue, carrying thin-walled, fairly large vessels. Near its outer surface there was a condensed zone of fibrous tissue which was apparently the original capsule of the spleen. It was covered by fibrofatty tissue, as part of the adhesions of the cyst to the surrounding structures (omentum, diaphragm, parietal wall, splenic flexure of colon and body and cardia of the stomach). There were plasma cells and lymphocytes scattered through the wall. Focal areas of necrotic tissue buried in the fibrous wall seemed most likely to be previous trabeculae of the spleen. There was no endothelial or epithelial lining to the cyst; the lining was necrotic or fibrous tissue. There was extensive calcium siderotic pigmentation of the fibrous trabeculae in the relic of the spleen with an occasional focal area of similar calcium siderotic deposition close to capsule. Similar staining of finer fibers in the pulp was also seen. There was some hemorrhage in this splenic tissue. The diagnosis was as follows: there was a post-traumatic cyst of the spleen, apparently secondary to hemorrhagic destruction of splenic pulp (auto accident, July 30, 1947).

Thirty-two days after removal of the cyst the patient left the hospital on convalescent furlough following which he returned to full military duty. He has remained well.

SUMMARY

A case of hemorrhagic (post-traumatic) cyst of the spleen is presented. The cyst developed secondary to an abdominal injury incurred at the time of an automobile accident which resulted in a fracture of the right humerus. A large abdominal mass developed but was not noted until two months after injury. Complete recovery resulted after splenectomy and extirpation of the cyst together with the tail of the pancreas.

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CYSTIC HYGROMA OF THE GROIN*

A RARE ENTITY

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DESPITE a general impression that cystic hygroma may occur in the groin, it is probably an extreme rarity. Almost all of the articles on cystic hygroma, presenting fairly large series, locate these in the neck and in the axilla. Gross and Goeringer[1] reported twenty-seven cases of cystic hygroma of the neck and mediastinum without any similar lesions in the groin; yet they mention the possibility of its occurrence. Goetsch[2] reported ten cervical cases and two in axilla but none in the groin. Isidore Cohn[3] cites Duany and Rivero who, he stated, reported the second case of a cystic lymphendothelioma in the groin which he had been able to find in the literature. Horsley[4] reported one case which might be considered a hygroma of the groin. These three are the only ones which we were able to locate in the literature.

It is interesting to note that at least two of these three reported cases have been observed in adults. This is in contrast to cystic hygroma in the neck, mediastinum and axilla. Gross stated that 90 per cent of the hygromas are observed by the end of the second year of life.

Because of the apparent rarity of the lesion I would like to report an instance which seems to be a typical cystic hygroma of the groin.

CASE REPORT

A female child, twenty-two months old, was admitted to the Robert Packer Hospital on the evening of June 11, 1949. The mother stated that the child had been in splendid health, but that on the day preceding its admission she had first noted a non-tender mass in the left groin. There had been no collateral symptoms. The physical examination was entirely normal with the exception of a mass about 8 cm. in diameter which was present in the left inguinal region and entering into the left labium majus. This mass had a slightly bluish color, was quite hard and seemingly irregular. It was not in the least bit tender. The admitting diagnosis was incarcerated hernia.

All the laboratory findings were normal for a child of this age except for a mild anemia. The temperature and pulse were normal. X-ray examination of the chest was normal. An operative intervention was carried out under cyclopropane anesthesia. An inguinal incision was made and a huge mass was found which extended into the femoral triangle and into the labium majus. Upon incising the mass there was a gush of fresh blood under considerable pressure. Dissection revealed that this was a hemorrhage into one of many cystic lobules.

The cysts varied in size from 2 to 3 mm. to about 2 to 3 cm. The hemorrhagic one was about 5 cm. in diameter. The cysts were densely adherent to each other but did not communicate. Many of them were also adherent to the surrounding structures; they were extremely thin-walled and many of them ruptured almost on touch. As much of the cystic mass was removed as possible. The remaining small cystic portions were cauterized with phenol. The wound was closed primarily. The child made an uneventful recovery and was discharged from the hospital on the tenth day.

The child has been followed for about a year. A small cystic mass about 2 cm. in diameter still remains. Other than this the child appears to be growing normally.

The pathologic report revealed areas of granulomatous reaction with recent fibrous tissue and leukocytic infiltration around dilated lymph spaces. There was also a considerable amount of hemorrhage throughout the specimen.

COMMENT

This case reports apparently a true cystic hygroma occurring in the groin of a child of

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less than two years. The origin of this condition is impossible to determine as the embryologic growth in the area differs from the more usual location of similar entities in either the neck or axilla. The hemorrhage into the tumor is not unusual in the neck.

Although this location for this lesion is probably a real rarity, it must nevertheless be retained in the literature as a possible site for the occurrence of cystic hygroma and must be considered in the differential diagnosis of the tumefactions of the groin in infants and children.

SUMMARY

A case of a cystic hygroma of the groin in a child is reported. It is a lesion of great rarity. It is, however, clear that this condition does occur in the groin.

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Recently we have come to realize that the syndrome of clubbed fingers, polycythemia and cyanosis in the absence of cardiac disease or malformation should make one suspicious of a possible pulmonary arteriovenous fistula. X-rays in such cases will show definite shadows that are almost pathognomonic of this condition. A recent experience would seem to indicate that many of these cases can be greatly benefited by a simple ligation of the pulmonary artery. Pathologically, the lesions are often multiple and some authorities believe they are possibly related to the condition known as hereditary hemorrhagic telangiectasia. (*Richard A. Leonardo, M.D.*)

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Outside the Ivory Tower

(*continued from page 28*)

bacteria, including the sporebearers who are not hurt by boiling temperature.

MODERN treatment for the one million victims of Parkinson's Disease in the United States can result in this distressing malady being well controlled, and often alleviated almost completely, said Dr. John C. Button Jr., chairman of the Medical Advisory Council of the Parkinson's Disease Foundation. The disease, which is also known as "shaking palsy," causes progressive paralysis accompanied with uncontrollable trembling. It may be caused by sleeping sickness, influenza, grippe and in older individuals, hardening of the arteries of the brain.

Dr. Button, who is medical director of the Button Neurological Institute, Orange, New Jersey, stated that "a large proportion of the public long has been under the mistaken impression that little or nothing can be done for the estimated one million sufferers of Parkinson's Disease in this country. That such a belief is far from the truth is being demonstrated every day in the few institutions in which the modern treatment of this condition is properly and adequately given."

The purpose of the Parkinson's Disease Foundation, which is planning to set up units of its national organization in the major cities of the United States, is to provide funds for the treatment of victims of Parkinson's Disease, most of whom have lost their means of livelihood as a result of long-continued disability. The Parkinson's Disease Foundation, which has national headquarters at 744 Broad Street, Newark, New Jersey, is interested in hearing from individuals and organizations interested in treatment of this disease.

DIVORCES granted in the United States in 1949 show a decline for the third year in a row. The estimated total for the year was 391,000, which is a reduction of 7 per cent from the 1948 total of 422,000, and of 38 per cent from the peak year 1946. Despite this trend the number of divorces granted last year was the sixth highest in the country's history, exceeding that for every year prior to 1944, and more than one-fifth higher than the figure for 1942, the first year of United States' participation in World War II. The decline since 1946 was sharpest in the North, somewhat less marked in the South and least in the West. In seven widely separated cities, namely, Buffalo, Erie, Jacksonville, Knoxville, Minneapolis, New York and Portland, the decline was more than 50 per cent.

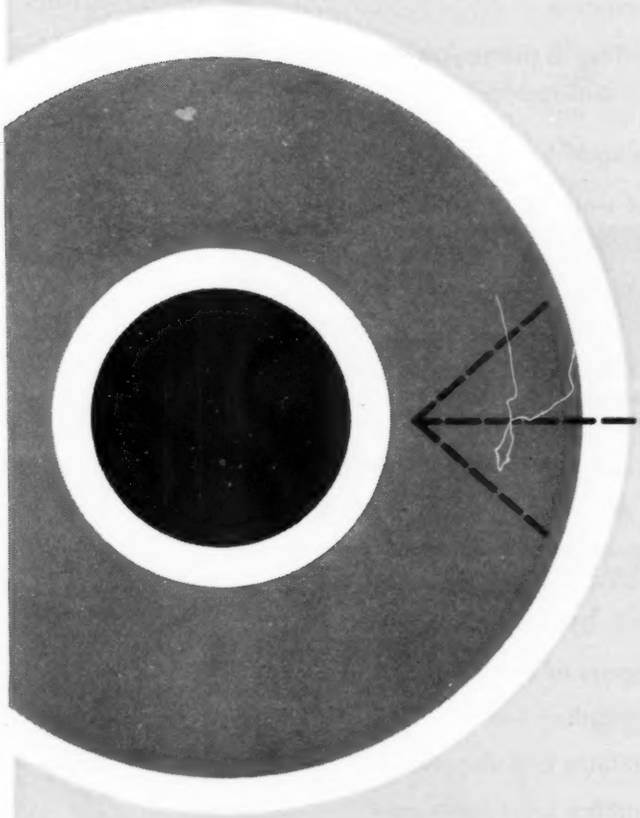
THE only source of obesity is food and the only treatment for it is diet, Dr. Edward H. Rynearson, consultant of the Division of Medicine at Mayo Clinic, told the fifty-ninth annual meeting of the Association of Life Insurance Medical Directors. This broad statement excludes the extremely rare individual whose overweight is secondary to or associated with diseased conditions. But there is nothing which can add fat to the body except food, and there is no hormone or other medicine which can remove a pound of fat. The single exception is thyroid extract, which should be used only in occasional cases and under the direction of a physician. Pointing to the analogy between the compulsive drinker and the person who turns to his refrigerator for comfort Dr. Rynearson said there needs to be a "Calories Anonymous." He said that obesity in the United States has been treated too lightly for too long.

"The appetite which is the cause of obesity is affected by psychologic and socio-economic conditions," Dr. Rynearson said. "Fatness is not inherited but people are born into circumstances which encourage greater intake of food, resulting in overweight.

"Unfortunately we have no willpower pills; if the patient does not want to lose weight more than anything in the world and is unable to follow a low calorie diet without supervision, there is no chance of his losing weight."

THE population picture in our country is much brighter now than it was only ten years ago. The census of 1940 showed the lowest rate of population growth we had ever experienced in a decade. Population experts, reflecting the pessimism then current, predicted that our numbers were already close to a maximum and that our economic and social life would henceforth be geared to the requirements of an ultimately declining population.

That outlook contrasts sharply with the situation today. Our country has come through a gigantic World War successfully; it has converted quickly to a peacetime economy and is now in a period of unprecedented prosperity. The census taken earlier this year showed a population increase of 19,000,000 in the decade. We are entering the second half of the century with 151,000,000 people and with the promise of adding many millions more before the century is over.



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1. Heins, H. C., Jr.: South Carolina M. A. 46:309, 1950

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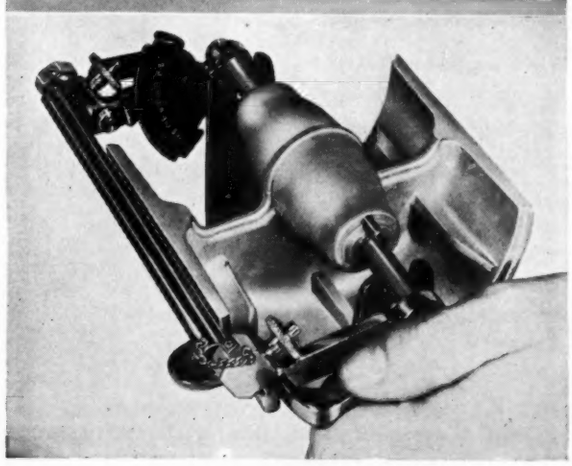

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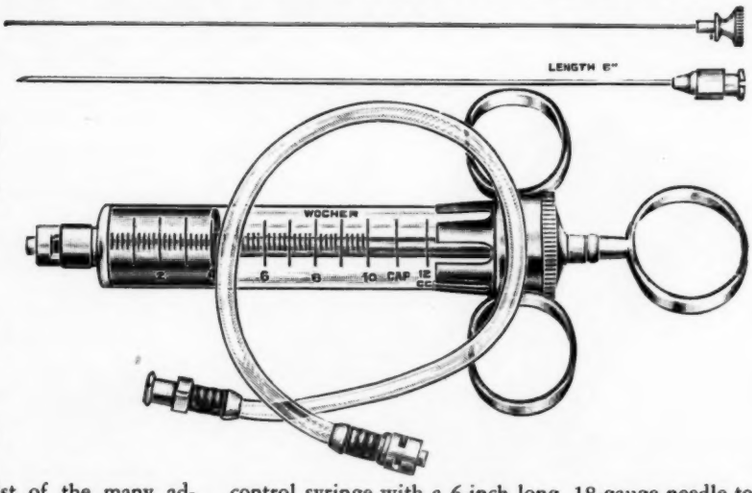

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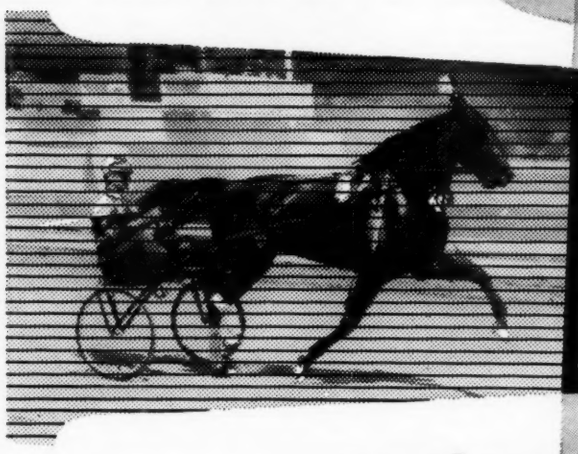

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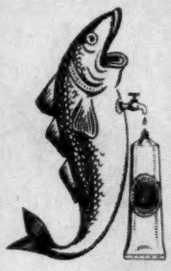

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1. Behrman, H. T., Combes, F. C., Bobroff, A., and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.

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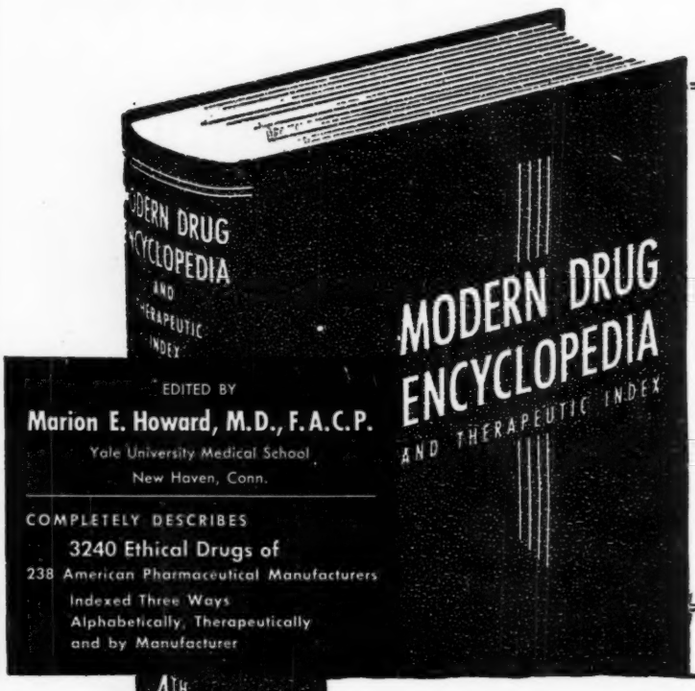

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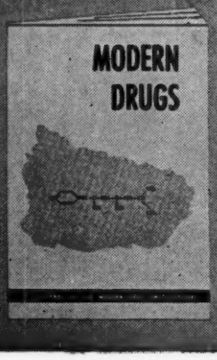

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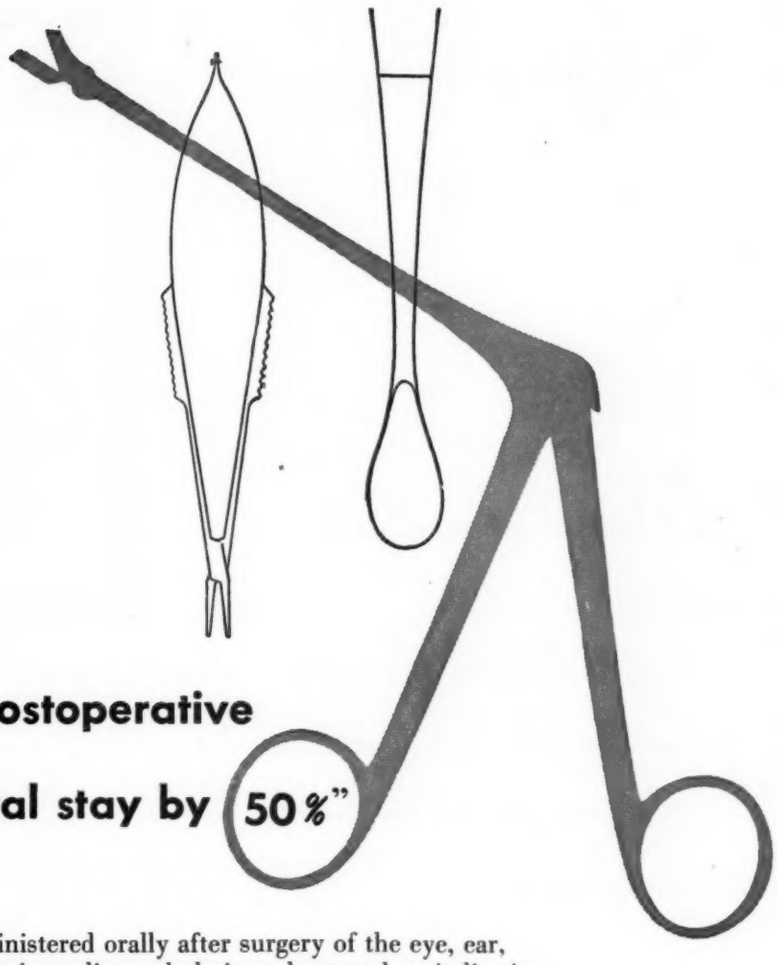

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1. *Barnett, S.E.: Eye, Ear, Nose & Throat Monthly 39:19, 1950.*

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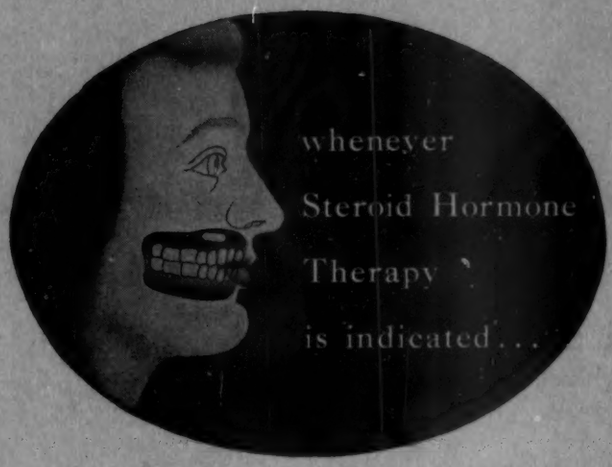

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1. Escamilla, R. F.: Am. Practitioner 3:425, March, 1949
2. Lisser, H., et al.: Postgraduate Med. 8:393, November, 1950

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